APPENDIX A
Record of Decision

United States of America
v.
City of Attleboro, Massachusetts, et al.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 1

SHPACK LANDFILL SUPERFUND SITE
RECORD OF DECISION SUMMARY
SEPTEMBER 2004

DECLARATION FOR THE RECORD OF DECISION

A. SITE NAME AND LOCATION

Shpack Landfill Superfund Site
Norton/Attleboro, MA.
CERCLIS ID # MAD980503973

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Shpack Landfill Superfund Site, in **Norton/Attleboro, MA**, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 USC § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended. The Director of the Office of Site Remediation and Restoration (OSRR) has been delegated the authority to approve this Record of Decision.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113 (k) of CERCLA, and which is available for review at the Norton Public Library and at the United States Environmental Protection Agency (EPA) Region 1 OSRR Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix C) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The Commonwealth of Massachusetts concurs with the Selected Remedy. The Commonwealth's letter of concurrence can be found in Appendix A.

C. ASSESSMENT OF THE SITE

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

D. DESCRIPTION OF THE SELECTED REMEDY

The selected remedy includes excavation and off-site disposal of material exceeding cleanup levels. This alternative eliminates the exposure pathways to soil and sediment.

The primary components of this alternative include:

•Coordination with local, state and federal agencies for excavating source area materials within a wetland and associated buffer zone;

•Preparation and implementation of a traffic control plan to adequately manage the increased volume of truck traffic associated with transportation of chemical and radiological impacted source material from the site;

•Preparation and implementation of a transportation and emergency spill contingency plan;

•Relocation of existing power line structures needed to implement the rest of the remedy in coordination with National Grid.

•Connecting two residences to public water. The two residences are identified as Union Road House 1 and Union Road House 2 in the Remedial Investigation;

•Mobilization/demobilization of all personnel and equipment to the site for construction activities;

•Clearing and grubbing areas of the site requiring excavation;

•Establishing a survey grid to conduct sequential consolidation of grid cells to minimize generation of large quantities of groundwater with one open excavation;

•Based on the selected risk scenario for the site (Adjacent Resident without Groundwater Consumption), excavation and off-site disposal of soil and sediment exceeding radiological and chemical Cleanup levels including dioxin and PCBs as identified in Tables L-1 and L-3, estimated in the FS as approximately 34,445 yd^3;

•Excavation and off-site disposal of sediment from the Inner Rung and exceeding the cleanup levels listed in Table L-2, estimated by the FS to be approximately 1,111 yd^3 soil/sediment. The FS estimated this will take a period of one month;

•Dewatering of open areas as needed in each area of the Site;

•Transportation of all impacted soils via truck and rail to an approved offsite disposal facility;

•All excavated soil and sediments disposed of in accordance with TSCA and the TSCA determination included as part of this ROD;

•Placement of clean fill in open areas to backfill to grade and/or wetlands restoration/replication as appropriate;

•Vernal pools and spotted turtle habitat will be surveyed to focus on the spotted turtle and marbled salamander and evaluate the habitat for any other rare species or species of special concern that may be found on the Shpack Site;

•Vernal pools and areas containing rare or species of special concern will be protected if possible or restored/replicated if impacted – an impact minimization and habitat restoration plan prepared and followed in conjunction with this work;

•All work in wetlands areas conducted in accordance with the Wetland Determination included in this ROD. In addition, work in wetlands, including replication and restoration, must comply with the Wetlands Protection Act Regulations, 310 CMR 10 as well as all other ARARs identified for this component of the remedy.

•Installation of a temporary chainlink fence surrounding the entire site, with access gates to secure the site during the design and construction phases of the cleanup;

•Preparation and implementation of a surface water, sediment and groundwater monitoring program, including installation of additional wells around the perimeter of the Site;

•Performance of 5-year reviews to monitor effectiveness of the remedy;

•Implementation of institutional controls to restrict future use of property and groundwater.

The selected remedy is based upon a future scenario in which a resident living next to the Site (adjacent resident) is connected to a public water supply and does not drink the groundwater at the site. The excavation and off-site disposal of waste materials exceeding cleanup levels addresses the threat of exposure to human health and environmental receptors. The estimated time for construction is 9-16 months.

This Record of Decision does not address groundwater contamination at and near the site. It addresses the risk of exposure to contaminated groundwater by installing a public waterline to the two homes adjacent to the site that are currently on private wells.

The selected response action addresses principal and low-level threat wastes at the site by eliminating exposure to human and ecological receptors from contaminated groundwater, soil, and sediment. This is accomplished through excavation and off-site disposal of wastes in soils and sediments exceeding cleanup levels and installation of a waterline. Long term monitoring and institutional controls will ensure that the remedy remains protective in the future.

This is intended to be the final Record of Decision for this site. The selected remedy is a comprehensive approach for this site that addresses all current and potential future risks presented at the site. These remedial measures will prevent exposure that presents an unacceptable risk to human health and ecological receptors and meets ARARs.

E. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable .

Based on the nature and extent of the waste materials at the site, EPA concluded that it was impracticable to excavate and treat all contaminated material in a cost-effective manner. Thus, the selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

F. SPECIAL FINDINGS

This ROD includes specific determinations made by EPA.

TSCA Determination

Under the Toxic Substances Control Act (TSCA), the Regional Administrator, EPA Region 1, finds that the remedial action selected meets the standards of 40 CFR 761.50 for remediation and that the selected remedy for excavation and offsite disposal of polychlorinated biphenyl (PCB) contaminated soil and sediment set out in this Record of Decision will not pose an unreasonable risk to human health or the environment pursuant to 40 CFR 761.61(c).

Section 404 of the Clean Water Act and Executive Order 11990 Determinations

Under Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands), EPA finds that the selected remedy, which involves excavating materials from wetland areas on the site, is appropriate as there is no practicable alternative to conducting work in the wetlands. The remedial action minimizes potential harm and avoids adverse effects to the extent practical. Best management practices will be used throughout the Site to minimize adverse impacts on the wetlands, wildlife, and its habitat. Damage to these wetlands will be mitigated though erosion control measures and proper re-grading and re-vegetation of the impacted area with indigenous species. Following excavation activities, wetlands will be restored or replicated consistent with the requirements of identified Federal and State wetlands protection laws.

G. AUTHORIZING SIGNATURE

This ROD documents the selected remedy for soils and sediments at the Shpack Landfill Superfund Site. This remedy was selected by EPA with concurrence of the Massachusetts Department of Environmental Protection.

In approval of the Toxic Substances Control Act finding only:

By: _____ **Date:** September 28, 2004

Robert W. Varney
Regional Administrator
EPA-New England
Region 1

In approval of the Record of Decision:

By: _____ **Date:** 9/30/04

Susan E. T. Studlien, Director
Office of Site Remediation and Restoration

FIGURES

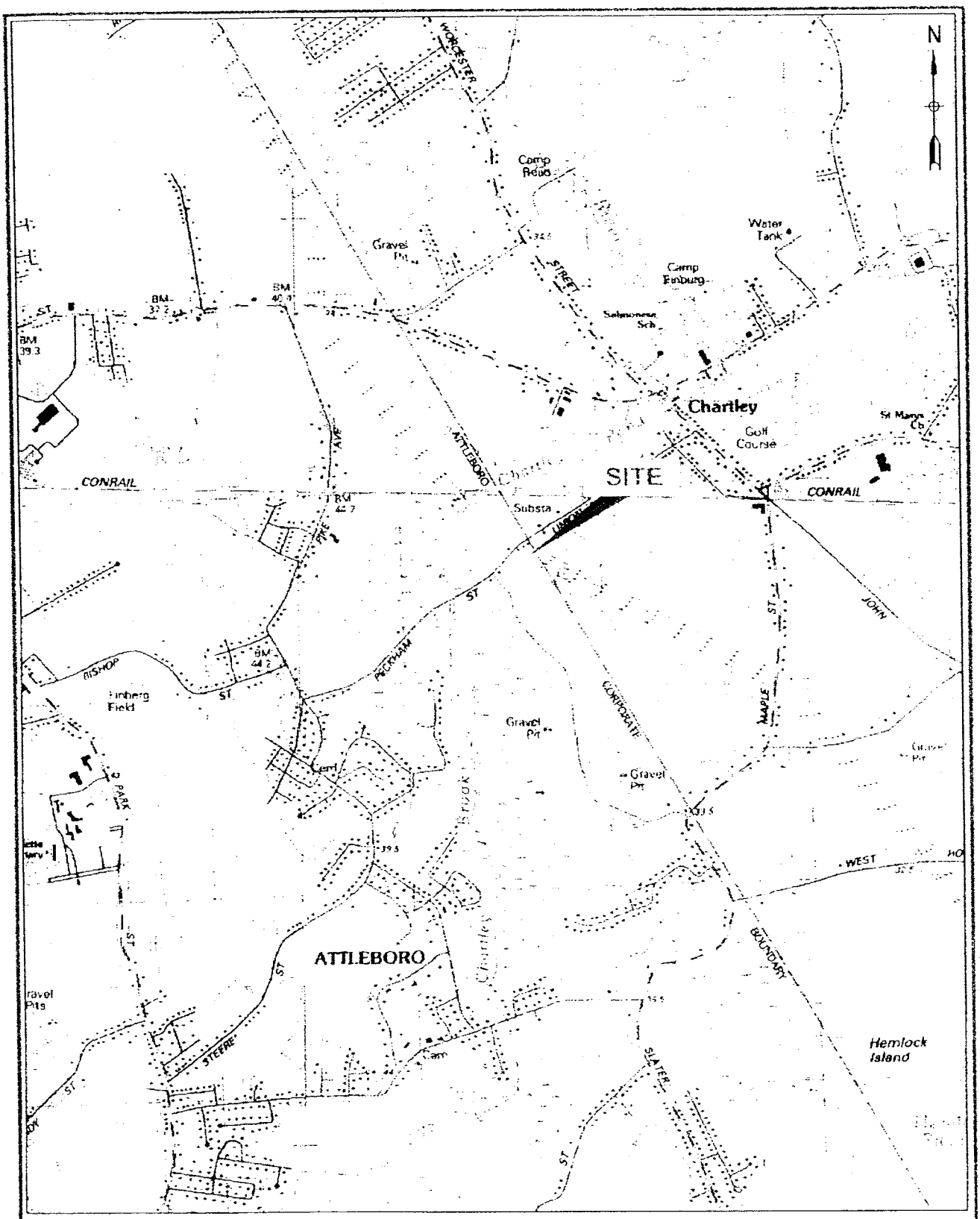

Figure 1 - Locus Map

Shpack Landfill Superfund Site - Norton and Attleboro, MA

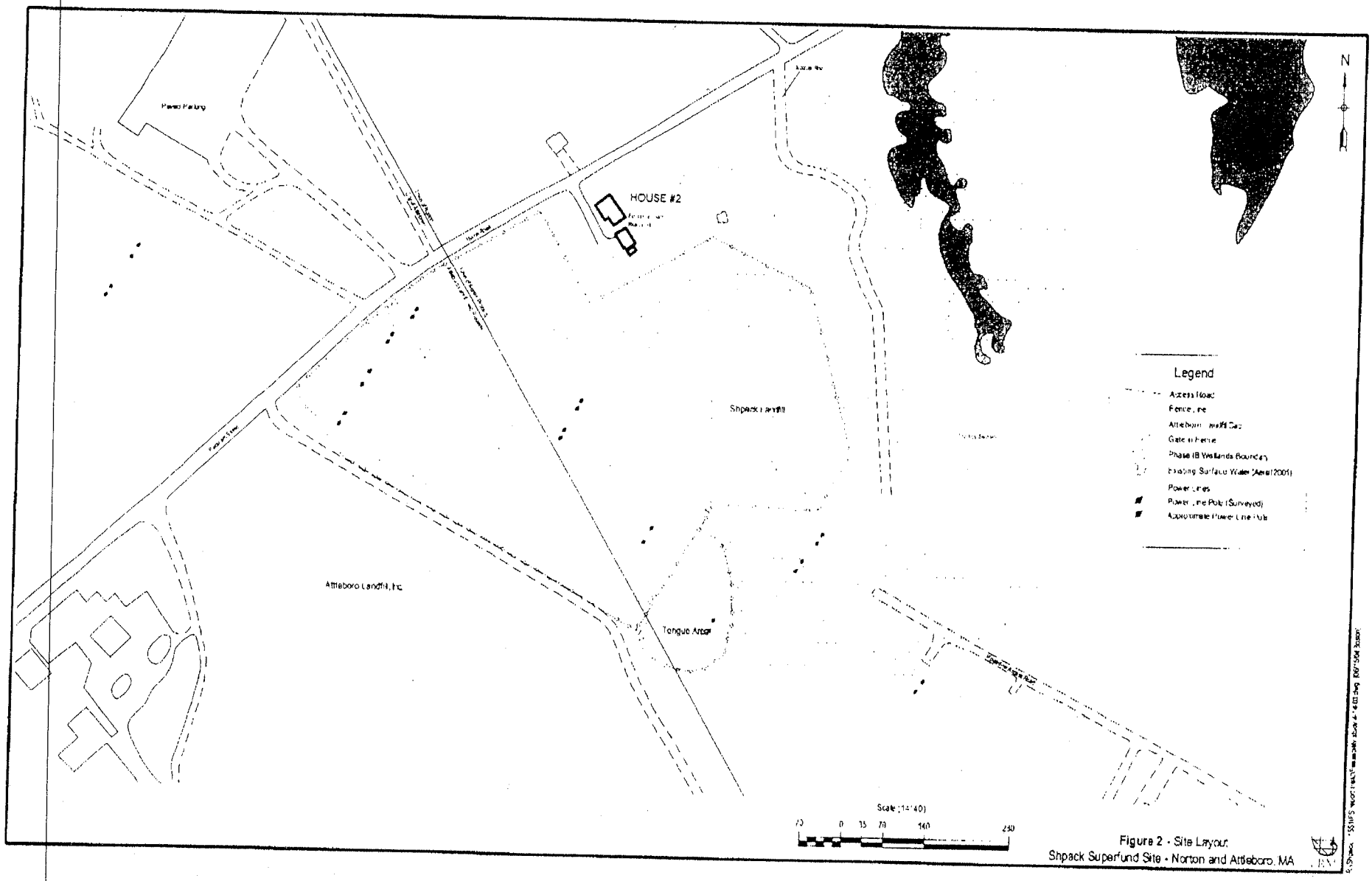

Figure 2 - Site Layout
Shpack Superfund Site - Norton and Attleboro, MA

Original includes color coding.

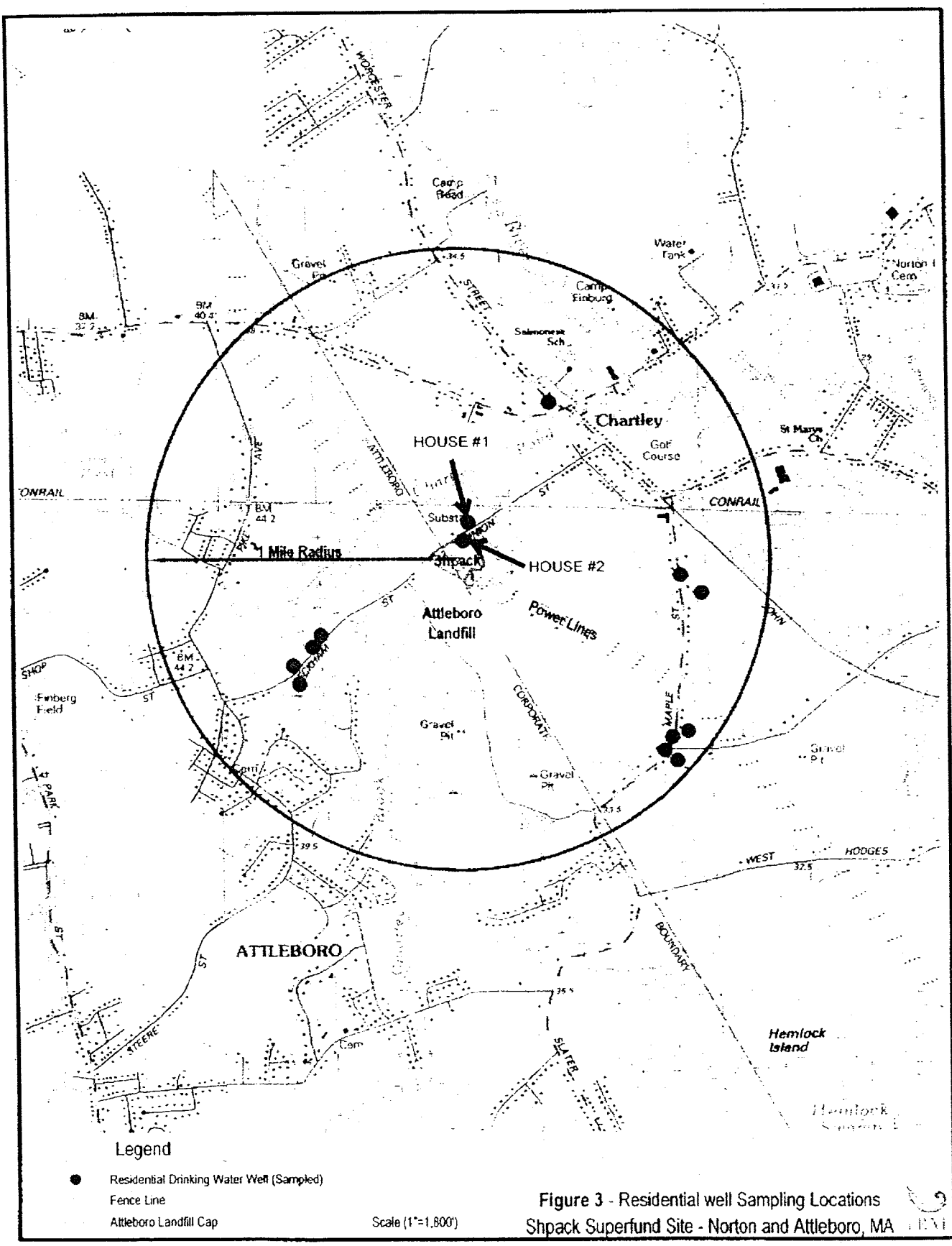

Figure 3 - Residential well Sampling Locations
Shpack Superfund Site - Norton and Attleboro, MA

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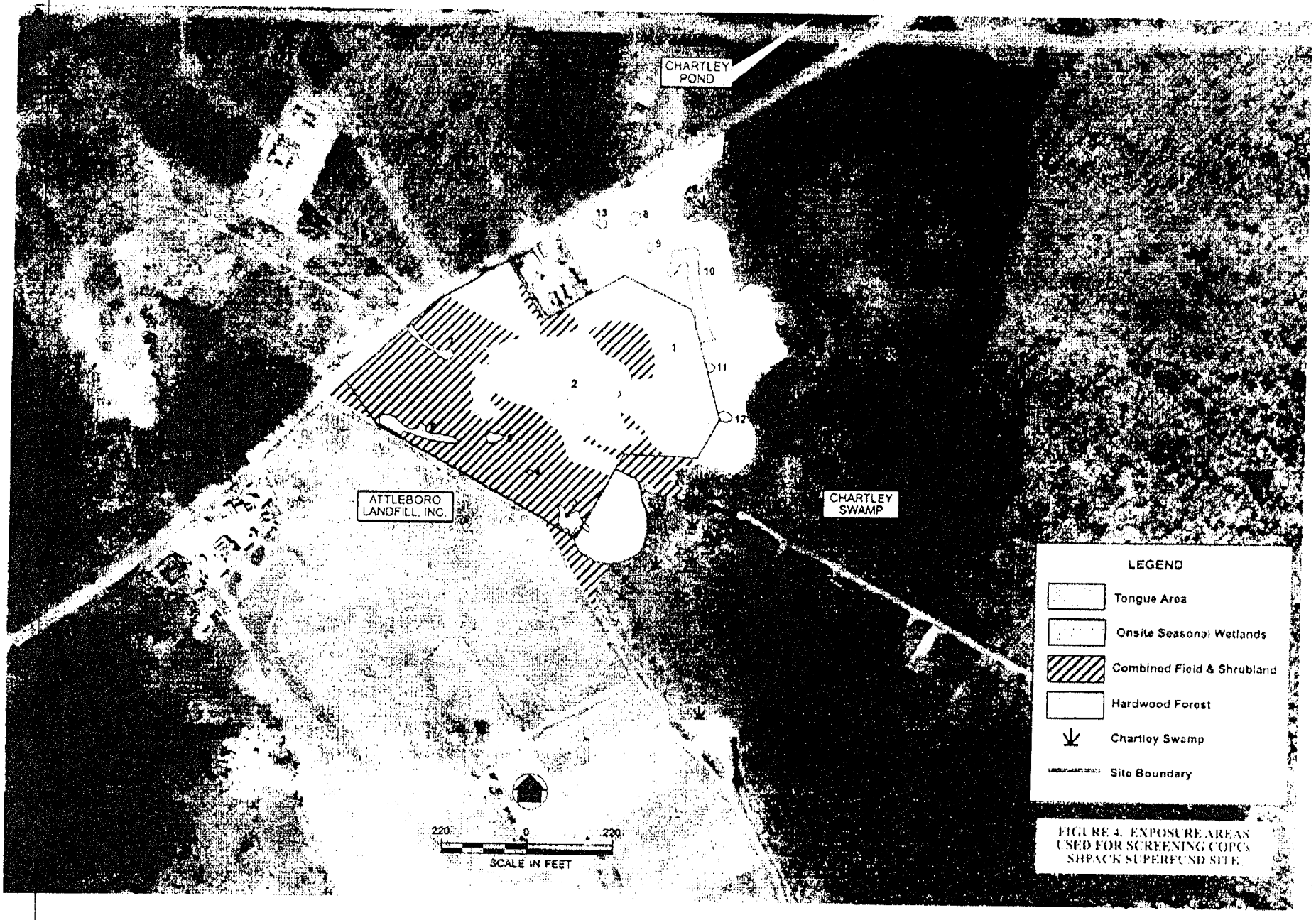
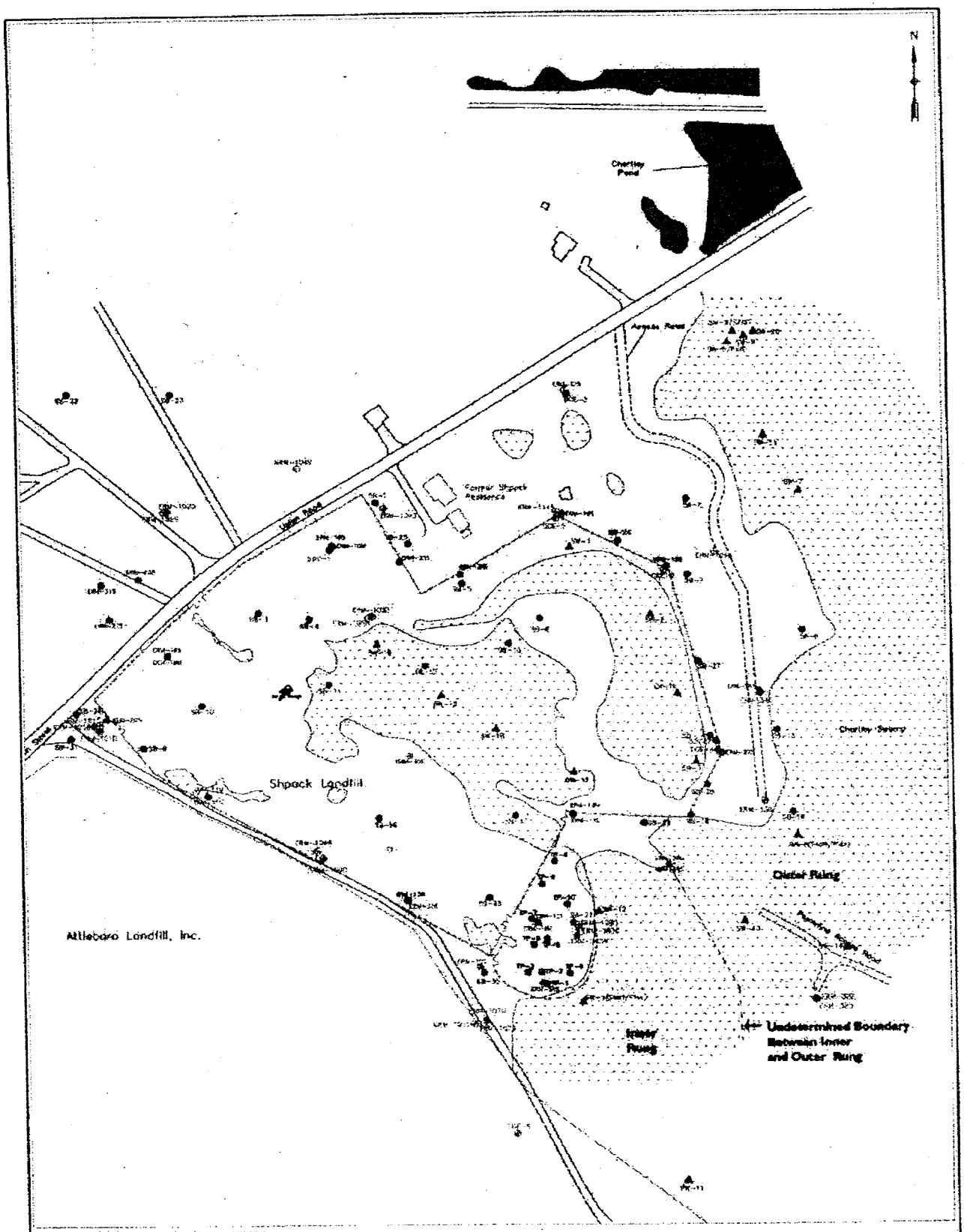


FIGURE 4. EXPOSURE AREAS USED FOR SCREENING COPCs SHPACK SUPERFUND SITE



Environmental Resources Management
Shpack Landfill
Attleboro, Massachusetts
Undetermined Boundary Between Inner and Outer Ring
Date: 07/08/03
Figure No. 5

PART 2: THE DECISION SUMMARY

A. SITE NAME, LOCATION AND BRIEF DESCRIPTION

- Shpack Superfund Site, Norton/Attleboro, MA; Union Road/Peckham Street.
- National Superfund electronic database identification number, e.g., CERCLIS identification number: MAD090503973
- Lead Agency: U.S. Environmental Protection Agency, Region I
- Former site for disposal of industrial and municipal waste.

Site Description

The Shpack Site consists of 9.4 acres on the border between the Town of Norton, Massachusetts and the City of Attleboro, Massachusetts.; approximately 6.0 acres in Norton were owned by Isadore and Leah Shpack and operated as a dump. The Town of Norton now owns this portion of the Site. The adjacent 3.4 acres located in Attleboro are a small portion of the landfill currently owned by Attleboro Landfill Inc. (ALI). ALI's entire facility is approximately 55 acres in total and approximately 110 feet high and operated most recently as a landfill accepting municipal waste. With the exception of this 3.4-acre parcel that EPA is addressing, ALI Landfill is being regulated by the Massachusetts DEP's solid waste landfill program. In 1986, the United States Environmental Protection Agency (EPA) placed the Site on the National Priorities List (NPL). See Figure 1 for Locus Map of the immediate vicinity around the site.

A more complete description of the Site can be found in Section 1 of the RI Report (ERM-New England, June 2004).

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. History of Site Activities

Between 1946 and the 1970s, the Shpack Site received domestic and industrial wastes, including low-level radioactive waste. The filled areas where the wastes were dumped are overgrown and entirely enclosed by a chain link fence. The Site itself is relatively flat with vegetated minor depressions and knolls and was formerly a flat wetlands area. A powerline transmission corridor divides the Site into two portions. The ALI Landfill lies directly west of the site. The Site is bounded on two other sides by the Chartley Swamp that drains under Union Road to Chartley Pond. There are two homes on private drinking water wells within 500 feet of the Site. See Figure 2 for a map of site features, sampling points, and nearby landmarks

In 1980, the Shpack Site was added to the Department of Energy's (DOE) Formerly Utilized Remedial Action Program (FUSRAP), which dealt with the legacy of the nation's early atomic energy programs. The uranium discovered at the site in the late 1970's is thought to have originated from local businesses that constructed reactor cores for the early naval propulsion program from the early 1950's until the mid-sixties.

A more detailed description of the Site History can be found in Section 1.2.2 of the RI Report.

2. History of Federal and State Investigations and Removal and Remedial Actions

In 1978, a concerned citizen who had detected elevated radiation levels at the site contacted the Nuclear Regulatory Commission (NRC). The NRC conducted an investigation that confirmed the presence of radioactivity above background levels. The NRC determined that certain operations associated with government activities might have resulted in the deposition of radioactive materials within the Shpack Landfill. The primary constituents of concern found were radium and uranium. It is not known exactly when these radioactive materials were deposited at the site.

The NRC investigation concluded that the Shpack Landfill was a candidate for the FUSRAP program. On behalf of the NRC, Oak Ridge National Laboratory (ORNL) conducted a radiological survey in 1980 that identified metallic wastes containing uranium of various enrichments. The ORNL report confirmed the NRC preliminary findings and defined general areas of radiological contamination. In 1998, FUSRAP responsibility was transferred from DOE to the United States Army Corps of Engineers (USACE) and a gamma walkover survey was performed to further delineate the radiological contamination.

In October of 1981, a security fence was installed around the site on behalf of DOE to prevent unauthorized access. With the exception of the area located in the section of the site known as the Tongue Area and an approximately 1,000-foot section of replacement fence, this fence is the same fence that currently is located on the Site. Additional studies conducted by DOE between 1982 and 1984 identified chemical contamination (volatile organic compounds (VOCs) and metals) in groundwater. In 1984, EPA evaluated the site to determine if it should be listed on the National Priority List (NPL). The site was added to the list in June 1986.

A summary of preliminary investigations performed at the Site prior to 1990 is included in Table 1 of the RI. These investigations included sampling of various environmental media and primarily focused on evaluating radiological impacts at the Site.

In 1990, a group of potential responsible parties formed the Shpack Steering Committee (SSC) and individual companies comprising the SSC entered into an Administrative Consent Order (AOC) with EPA (EPA Docket No. I-90-1113, June 24, 1990) which required them to conduct the Remedial Investigation/Feasibility Study (RI/FS) for the Site. In November 1991, the SSC prepared and submitted a Site Characterization Work Plan (SCWP) for the first phase of the RI, known as "Phase IA". Between 1991 and 1992, the SSC implemented Phase IA of the RI, which was a comprehensive investigation of potentially impacted media at the Site. The Phase IA identified chemical impacts in soil, groundwater, sediment and surface water at the site. Non-radioactive constituents of concern identified on Site during the Phase IA include:

- Volatile organic compounds (VOCs);
- Semi-volatile organic compounds (SVOCs);
- Polychlorinated biphenyls (PCBs);
- Pesticides;

- Dioxins/furans; and,
- Inorganics.

The results of the Phase IA RI activities were documented in ERM's 1993 Initial Site Characterization (ISC) Report. In addition, the Phase IA contains a detailed summary of the previous investigations listed in Table 1 of the RI. With the exception of residential well monitoring activities, no chemical investigation activities were performed at the Site after the Phase IA ISC Report.

In 1999, the SSC in conjunction with EPA, the Corps of Engineers FUSRAP program, and DEP began preparation of work plans to implement Phase IB of the RI. The Phase IB activities included the following:

- Monitoring well Installation;
- Groundwater sampling;
- Surface water and sediment sampling;
- Soil sampling;
- Tar area delineation;
- Well functionality and site survey;
- Site fence extension;
- Test pit excavation in Tongue Area;
- Groundwater gauging;
- Residential well sampling;
- Surface water drainage characterization

The Phase 1B activities were completed in 2003. The Results of the Phase IB investigations, as well as the prior investigations are documented in the RI Report.

3. History of CERCLA Enforcement Activities

On June 7, 1990, EPA notified approximately 12 parties who either owned or operated the site property, generated wastes that were disposed of at the Site, arranged for the disposal of wastes at the Site, or transported wastes to the Site of their potential liability with respect to the Site. As a result of this notification, a group of PRPs formed a steering committee, called the Shpack Steering Committee (SSC). In 1990, EPA and the SSC entered into an Administrative Order on Consent (Docket No. I-90-1113) which required those signing the AOC to conduct the RI/FS for the Site. The RI/FS was completed in June 2004.

On April 2, 2003, EPA notified DOE of its potential liability with regard to the Site. Beginning in 1998, as part of its FUSRAP responsibilities, USACE has been conducting investigations of the radiological waste at the Site. Finally, a number of other parties have received "Potentially Interested Party" letters from EPA. Additional parties that have potential liability for the Site may be identified in the future.

C. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been high. EPA has kept the community and other interested parties apprised of Site activities through informational meetings, fact sheets, press releases, and public meetings. Below is a brief chronology of public outreach efforts.

- Local residents formed the Citizen's Advisory Shpack Team (CAST) to monitor Site activities. CAST has been actively involved in organizing community review of activities conducted at the Site and providing input to the various government agencies involved at the Site.

- On numerous occasions during 2000-2004, EPA and DEP held informational meetings at the Solmonese School in Norton, Massachusetts to update the community on the results of the Remedial Investigation and Feasibility Study.

- On November 20, 2003, EPA held an informational meeting in Norton, Massachusetts to discuss the results of the Remedial Investigation.

- On June 18, 2004, EPA published a notice of Proposed Plan in the Attleboro Sun Chronicle. The plan was made available to the public on June 24, 2004 at the Norton Public Library (25th) and the EPA office repository.

- The Proposed Plan contained a proposed determination with regard to offsite disposal of PCB-contaminated material pursuant to the Toxic Substances Control Act (TSCA). The Proposed Plan also contained a draft finding that there is no practical alternative to conducting work in the wetland areas of the Site under Section 404 of the Clean Water Act and Executive Order No. 11990. There were no proposed waivers of ARARs included in the Proposed Plan.

- On June 23, 2004, EPA held an informational meeting to discuss the results of the Remedial Investigation and the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan to a broader community audience than those that had previously been involved at the Site. At this meeting, representatives from EPA, MA DEP, and the US Army Corps of Engineers answered questions from the public.

- On June 24, 2004, EPA made the administrative record available for public review at EPA's offices in Boston and on June 25th at the Norton Public Library. This will be the primary information repository for local residents and will be kept up to date by EPA.

- From June 24, 2004, the Agency held a 30-day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. An extension to the public comment period was requested and as a result, the comment period was extended to August 25, 2004.

- On July 21, 2004, EPA published a notice of the extension of the comment period as well as a rescheduled public hearing date (August 4, 2004) in the Attleboro Sun Chronicle.

- On August 4, 2004, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the Responsiveness Summary, which is part of this Record of Decision.

D. SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy was developed by combining components of different source control activities to obtain a comprehensive approach for Site remediation. In summary, the remedy provides elimination of the threat posed by exposure to contaminated soil and sediment exceeding cleanup levels through excavation and disposal off site. Groundwater threats are being addressed by connecting impacted residents to a public waterline and through the imposition of institutional controls.

The soil and sediment component of the selected remedy is based upon a future exposure scenario that envisions a resident that lives next to the landfill (adjacent resident) who is connected to a public water supply and therefore does not use site groundwater for drinking water, etc. EPA believes the adjacent resident scenario is the most realistic exposure scenario for this site. It is highly unlikely that the Site could be used for residential development given that most of the Site consists of wetlands and is bisected by high tension power lines. This cleanup plan is also protective for potential future passive recreation at the site.

The selected remedy does not address Site groundwater. This decision is based upon recent MADEP correspondence with EPA that indicates the State may revise the "use and value" of this aquifer downward from its current designation as "high" to a "low " or "medium" use and value should adjacent residents abandon their existing wells, connect to the public water supply system, and restrict the installation of future wells.

In its concurrence letter to EPA, Massachusetts stated that once the remedial action has been implemented and private drinking water wells eliminated, this portion of the aquifer would no longer be considered a current or future water supply under the Massachusetts Contingency Plan. At that point, MA DEP will revise its Groundwater Use and Value Determination to a low use and value provided these wells are decommissioned and controls placed on these properties that prohibit the future use of groundwater.

EPA understands that once the remedial action has been implemented and private drinking water wells eliminated as described above, MA DEP will send to EPA its revised use and value determination documenting this revision.

In these circumstances, given MA DEP's commitment to issue a revised use and value determination once the remedial action has been implemented, EPA, in selecting the remedy, believes it is appropriate to issue a low use and value determination for this portion of the

aquifer. This determination is consistent with EPA's "Groundwater Use and Value Determination Guidance."

A "low" use and value determination here means that EPA does not consider this groundwater suitable as a drinking water source. As a result, the selected remedy does not address groundwater contamination.

E. SITE CHARACTERISTICS

Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. Wastes generally considered to be principal threats are liquid, mobile and/or highly-toxic source material.

Low-level threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. Wastes that generally considered to be low-level threat wastes include non-mobile contaminated source material of low to moderate toxicity, surface soil containing chemicals of concern that are relatively immobile in air or ground water, low leachability contaminants or low toxicity source material.

Nature and Extent of Contamination

This section presents the nature and extent of impacts at the Site. The distribution of impacts is presented by media and class of compounds to document the location of areas of concern at the Shpack Site.

For the purposes of presenting the data in the RI, the Site was divided into two separate areas, as follows:

- ***Landfill Interior*** – This area includes all sampling locations inside the chain link fence surrounding the Site, including the Tongue Area and samples collected between Shpack and the ALI Landfill. (Now referred to as Site Interior)

- ***Outside the Fence*** – This area includes all sampling locations outside the chain link fence north and east of the Site.

In general, waste disposal practices at the Site have resulted in a highly variable distribution of constituents of concern in soil and groundwater across the Site Interior. Although hot spots exist, a discernable pattern of contaminant distribution was not observed (e.g. a discrete source area with a plume emanating from it). Although impacts have been identified Outside the Fence, they are generally located immediately adjacent to the Shpack Site interior. A description of the type and distribution of impacts identified at the Site is provided below.

Background Environmental Quality

Background reference samples for chemical constituents in soil, groundwater, sediment and surface water were collected as part of the RI The following samples were collected as part of the Phase IB field activities and were designated as background for the purposes of evaluating the data:

- Soil – SB-22, SB-23, ERM-102D, ERM-104S;
- Groundwater – ERM-102D, ERM-102S, ERM-104D, ERM-104S; and
- Surface Water and Sediment – SW-4 (D), SW-10 (D), SW-11 (D), SW-22 (D), and SW-23 (D).

In addition, in March 2004, additional background samples were collected in support of the Screening Level Environmental Risk Assessment or "SLERA" (M&E, 2003) and the Baseline Environmental Risk Assessment, or "BERA" (M&E, 2004). The following samples collected as part of this sampling event were identified as background samples:

- Soil - SB-32, SB-33, SB-34, SB-35, SB-36, SB-37, SB-38, and SB-39; and
- Surface Water and Sediment – SW-24, SW-25, SW-26, SW-27, SW-28, SW-29, and SW-30.

Analytical data for background samples are included in data tables for each media. Sampling locations are depicted on Figure 3 of the RI. In addition, data included in the 1981 ORNL *Radiological Survey of the Shpack Landfill* (ORNL, 1981) provided background data for radiological compounds detected at the Site.

Soil

Soil samples were collected during the RI from various locations and depths across the Site. The analytical program was designed to evaluate impacts from waste disposal activities across the entire Site; therefore, the majority of soil samples collected at the Site were analyzed for a broad suite of chemical parameters.

The following subsections present the distribution of contaminants of concern in Site soils to give a site-wide perspective on the occurrence and concentration of contaminants of concern. The soil data was divided into two segments, as follows:

•***Shallow Soil*** – This data set represents soil samples collected from ground surface to a maximum depth of two feet below ground surface (bgs).

•***Deep Soil*** – This data set represents soil samples collected deeper than two feet bgs.

Distribution of Volatile Organic Compounds (VOCs) in Soil

The distribution of volatile organic compounds (VOCs) in shallow and deep soil samples is displayed on Figures 11 and 12 of the RI, respectively. Analytical data for VOCs detected in soil are presented in Table 6A of the RI. VOCs were not detected in shallow or deep background soil sampling locations (SB-22, SB-23, and ERM-102D).

The type and distribution of VOCs in soil demonstrate the following:

•The highest VOC concentrations in shallow soil are located in the north-central portion of the Site.
•The highest VOCs concentrations in deep soil are located southwest of the Site, on the ALI Landfill.
•Chlorinated solvents, including trichloroethene (TCE), tetrachloroethene (PCE), 1,2-dichloroethene and cis-1,2-dichloroethene (cis-1,2-DCE) were the primary VOCs detected. These compounds were detected at one to two orders of magnitude above any other VOC compound in soil.

A detailed summary of the various classes of compounds detected in soil is provided below.

VOCs in Shallow Soil –Site Interior

A total of 20 samples from shallow soil in the Site Interior were analyzed for VOCs. The highest concentration of total VOCs detected in shallow soil in the Site Interior was 3,380 micrograms per kilogram (ug/kg) at location SB-4. The predominant compound detected in SB-4 was TCE, at a concentration of 3,300 ug/kg. Total VOCs were detected above 1,000 micrograms per kilogram (ug/kg) at two other locations, SB-6 (1,470 ug/kg) and SB-12 (2,340 ug/kg). The predominant compound detected in SB-6 was TCE (1,000 ug/kg) and in SB-12 was 1,2-DCE (2,100 ug/kg). All three sampling locations (SB-4, SB-6 and SB-12) were located in the north-central portion of the Site Interior, as shown on Figure 11 of the RI. The spatial distribution of these compounds does not indicate a distinct or localized source area.

VOCs were detected below 100 ug/kg at 14 of the 20 sample locations, and between 100 and 1,000 ug/kg at three locations.

VOCs in Shallow Soil – Outside the Fence

A total of 11 samples from shallow soil Outside the Fence were analyzed for VOCs (Figure 11 of the RI). VOCs were detected at three of the 11 sampling locations. The highest concentration of total VOCs detected in shallow soils Outside the Fence was 29 ug/kg at SB-25, located north of the Site on the Shpack Residence property. Acetone was the only compound detected at SB-25, which is not consistent with the predominant VOC impacts (e.g. chlorinated solvents) in shallow soil in the Site interior.

VOCs in Deep Soil – Site Interior

A total of 13 samples from deep soil in the Site Interior were analyzed for VOCs (Figure 12 of the RI). The highest concentration total VOCs in deep soil was 54,300 ug/kg at ERM-107M (10-12 feet bgs), located on the ALI Landfill. The predominant compounds detected in this sample included:

- PCE = 38,000 ug/kg; and
- TCE = 13,000 ug/kg.

As shown on Figures 7 through 9 of the RI, ERM-107M is located upgradient of Shpack. The second highest concentration of total VOCs detected in deep soil was 11,088 detected in TP-3 (4-6 feet bgs), located on the Tongue Area, immediately downgradient of ERM-107M. This sample contained cis-1,2-dichloroethene (cis-1,2-DCE) at a concentration of 11,000 ug/kg. Cis-1,2-DCE is a degradation product of both PCE and TCE.

VOCs in Deep Soil – Outside the Landfill

A total of six deep soil samples were collected from Outside the Fence and analyzed for VOCs. VOCs were detected at one sampling location, SB-1, at a maximum concentration of 26 ug/kg total VOCs. SB-1 is located on the Shpack Residence property. PCE is the only compound detected in this sample, and is consistent with the type of VOCs (i.e. chlorinated solvents) detected in the Shpack Landfill.

Distribution of SVOCs in Soil

The distribution of semi-volatile organic compounds (SVOCs) in shallow and deep soil samples is displayed on Figures 11 and 12 of the RI, respectively. Analytical data for SVOCs detected in all soil samples is presented in Table 6B of the RI. SVOCs were detected in all shallow and two-thirds of the deep background soil sampling locations (SB-22, SB-23, and ERM-102D).

The type and distribution of SVOCs detected in soil samples collected at the Site demonstrate the following:

- SVOCs were detected in all areas of the Site Interior and the distribution of SVOCs does not indicate a distinct or localized source of SVOCs.
- The predominant type of SVOCs detected in soil at Shpack include both pyrogenic (i.e. combustion-based) and petrogenic (i.e. petroleum-based) polycyclic aromatic hydrocarbons (PAHs) and phenols. This is consistent with the nature of waste disposal activities with variable waste streams.
- The highest total SVOC concentration in soil is located on the ALI Landfill at ERM-101B.

- Where detected, SVOCs were generally detected at the detection limit or slightly above the detection limit Outside the Fence.

A detailed summary of the various classes of compounds detected in soil is provided below.

SVOCs in Shallow Soil – Site Interior

A total of 20 shallow soil samples were collected and analyzed for SVOCs in the Site Interior (Figure 11 of the RI). SVOCs were detected at all sampling locations in the Site Interior. The highest total SVOC concentrations detected in shallow soil in the Site Interior are as follows:

- SB-4 (710,060 ug/kg) in the north central portion of the Shpack landfill; and
- SB-9 (396,860 ug/kg) in the western portion of the Shpack Landfill.

All samples collected from the Site Interior contained SVOC compounds. Co-located samples collected as part of the Phase IA and Phase IB at both SB-4 and SB-9 soil boring locations indicate significant variability between the two data sets. The samples collected at SB-4 and SB-9 during the Phase IA contained total SVOC concentrations two to three orders of magnitude higher than concentrations detected in the same location during the Phase IB (Figure 11 of the RI). The temporal heterogeneity displayed between data sets may be attributable to variability of waste materials.

Of the remaining 18 shallow soil samples collected from the Site Interior, seven contained total SVOC concentrations between 10,000 and 100,000 ug/kg, and the remaining 11 samples contained total SVOCs below 10,000 ug/kg.

In general, SVOCs were detected in all areas of the Site, with localized areas of elevated concentrations (e.g. hotspots), and do not display a discernable pattern of distribution, which is consistent with the waste disposal practices at the Site (e.g. no point source).

SVOCs in Shallow Soil – Outside the Landfill

A total of 12 shallow soil samples were collected and analyzed for SVOCS Outside the Fence. SVOCs were detected at seven of the 12 locations. Two locations (SB-1, and SB-26) contained total SVOCs above 100 ug/kg, with the highest concentration (354 ug/kg) detected at SB-1 located on the former Shpack Residence property.

In general, the concentrations of SVOCs in shallow soils Outside the Fence were highest immediately adjacent to Shpack and decrease moving east.

SVOCs in Deep Soil – Site Interior

A total of 13 deep soil samples were collected and analyzed for SVOCs. The highest concentration of total SVOCs was 2,686,000 ug/kg, detected at ERM-101B (6-8 feet bgs) located on the ALI Landfill (Figure 12 of the RI). Only two other locations in the Site Interior contained total SVOCS at concentrations exceeding 100,000 ug/kg, including:

- SB-4 (193,680 ug/kg) in the north-central portion of Shpack;
- SB-9 (167,550 ug/kg) in the western portion of the Shpack;

Two locations contained total SVOCs between 10,000 ug/kg and 100,000 ug/kg, including:

- SB-16 (16,834 ug/kg) in the central portion of Shpack; and
- TP-3 (83,100 ug/kg) located in the Tonguc Area.

All other deep sampling locations in the Site Interior contained total SVOCs below 10,000 ug/kg.

The distribution of SVOCs in deep soil in the Site Interior is varied and does not display a discernable pattern, although localized areas with elevated concentrations exist.

SVOCs in Deep Soil – Outside the Fence

A total of three deep soil samples from Outside the Fence were analyzed for SVOCs. SVOCs were detected in one (SB-1) at a concentration of 5 ug/kg. This concentration is below the background concentration of 185 ug/kg.

Distribution of Pesticides and PCBs in Soil

The distribution of pesticides and polychlorinated biphenyls (PCBs) in shallow and deep soil samples is displayed on Figures 11 and 12 of the RI, respectively. Analytical data for pesticides and PCBs detected in all soil samples are presented in Table 6C of the RI. Pesticides and PCBs were not detected in shallow or deep background soil sampling locations (SB-22, SB-23, and ERM-102D).

The type and distribution of pesticides and PCBs detected in soil samples collected at the Site demonstrate the following:

- PCBs were only detected in the Site Interior and pesticides were detected in both the Site Interior and Outside the Fence.
- A discernable pattern of the lateral or vertical distribution of PCBs and pesticides impacts was not identified, which is consistent with the nature of waste disposal activities (e.g. variable waste deposition).
- A total of three Aroclors were detected, including Aroclors 1248, 1254 and 1260.

- A wide range of pesticides were detected in soil.

A summary of the PCBs and pesticides detected in soil is provided below.

Pesticides and PCBs in Shallow Soil – Site Interior

A total of 20 shallow soil sampling locations in the Site Interior were analyzed for PCBs (Figure 11 of the RI). The highest total PCB concentration detected in the Site Interior was 2,270 ug/kg at soil sampling location SB-13 (0-2 feet bgs) in the central portion of the Site. Aroclor 1248 was the primary component, at a concentration of 2,000 ug/kg. PCBs were also detected in a co-located sample at a concentration of 280 ug/kg, resulting in an average concentration of 1,275 ug/kg total PCBs at this location. At the remaining 19 sampling locations, total PCBs were detected below 100 ug/kg at nine locations and below 1,000 ug/kg at ten locations. The lateral distribution of PCB detections is heterogeneous across the Site and does not indicate a discrete source area or "hot spot".

A total of 20 shallow soil samples in the Site Interior were analyzed for pesticides. The highest total pesticide concentration detected was 1,180 ug/kg at soil sampling location SB-16 in the southern portion of the Site. Pesticides were detected in a co-located sample at a concentration of 119.9 ug/kg, resulting in an average total pesticide concentration of approximately 650 ug/kg. Total pesticides were detected below 100 ug/kg at all other sampling locations, except for sampling location SB-13 (200.78 ug/kg), which was located in the central portion of the Site.

Pesticides and PCBs in Shallow Soil – Outside the Fence

A total of 12 shallow soil samples Outside the Fence were analyzed for PCBs. PCBs were detected at two locations, SB-18 (15 ug/kg) east of the Site and SB-2 (7.9 ug/kg) north of the Site.

A total of 12 shallow soil samples Outside the Fence were analyzed for pesticides. Total pesticides were detected at six locations, with the maximum concentration of 10.89 ug/kg detected at SB-25 located on the former Shpack Residence property, north of the Site.

Pesticides and PCBs in Deep Soil – Site Interior

A total of 12 deep soil samples in the Site Interior were analyzed for PCBs (Figure 12 of RI). The highest concentration was 420 ug/kg, detected at location SB-4 (2-4 feet bgs), located in the north central portion of the Site. PCBs were not detected at seven of the 12 sampling locations. At the remaining five locations, PCBs were detected below 100 ug/kg at all locations, except ERM-105D, located near SB-4 in the north central portion of the Site.

A total of 12 soil samples from the Site Interior were analyzed for pesticides. Pesticides were detected at six of the 12 sampling locations. The highest concentration of pesticides was 74.8 ug/kg, detected at location SB-13 (2-4 feet bgs) in the center of the Site.

Pesticides and PCBs in Deep Soil – Outside the Fence

A total of three deep soil sampling locations were analyzed for pesticides and PCBs Outside the Fence. Pesticides and PCBs were not detected in any of the deep samples analyzed from Outside the Fence

Distribution of Dioxins/Furans in Soil

A total of two sampling locations from the Site Interior were submitted for analysis of dioxins/furans. Table 6D of the RI contains a summary of dioxins/furans detected in soil samples collected at the Site. Dioxins/furans were detected at both sampling locations. The highest concentration of total dioxins/furans was detected at ERM-105D (0-2 feet bgs) at approximately 30 ug/kg. Dioxins/furans were not detected in the deeper sample (22-24 feet bgs) collected at this location.

Distribution of Inorganics in Soil

A total of 68 soil samples were submitted for laboratory analysis of inorganics (which included metals and cyanide) during the RI. Table 6E of the RI contains a summary of inorganic constituents detected in soil samples collected at the Site. In general, the distribution of inorganics in soil indicated the following:

- The highest concentrations were located in the Tongue Area and the north central portion of the Site Interior, near ERM-105, SB-13, SB-4 and SB -12.
- The concentrations Outside the Fence were one to three orders of magnitude lower than the concentrations in the Site Interior.

The concentration of ten selected inorganics in shallow and deep soil are plotted on Figures 13 and 14 of the RI, respectively. The plotted data includes only those compounds detected above the maximum concentration (rounded up) in background samples SB-22, SB-23, ERM-102D or ERM-104S. A summary of the distribution of inorganics shown on these figures is as follows:

- Inorganics in soil exceeding maximum background concentrations were primarily constrained to the Site Interior.
- The distribution of inorganics detected above background on Site was variable across the Site Interior and is consistent with the nature of waste disposal activities (i.e. heterogeneous deposition).
- The highest concentrations of cadmium, chromium, nickel and zinc in both shallow and deep soils were in the Tongue Area (with the exception of zinc in shallow soil).
- The highest concentrations of arsenic in both shallow and deep soils were located in the western portion of the Site Interior
- The highest concentrations of lead in both shallow and deep soils were located in the north central portion of the Site Interior.

- The highest concentrations of barium in both shallow and deep soils were located in the northwestern and central portions of the Site.
- The highest concentrations of manganese, vanadium and silver in shallow and deep soils were located in the central portion of the Site Interior.

The extent of inorganics in soil does not appear to extend outside the Site Interior. The concentrations of inorganics in surface water and sediment (Section 4.4 and 4.5 of the RI) adjacent to the Tongue Area are consistent with elevated concentrations of metals observed in soil in the Tongue Area.

The highest concentrations of mercury were located in the southeastern portion of the Site adjacent to, and in, the Tongue Area, and at one sampling location in the north central portion of the site as follows:

- TP-1 = 41 mg/kg
- SB-17 = 30.7 mg/kg
- SB-21 = 22.2 mg/kg
- ERM-103B = 8.9 mg/kg
- SB-16 = 2.2 mg/kg
- ERM-105D = 3.6 mg/kg (north central portion of site)

All other mercury detections are below 2.0 mg/kg.

Cyanide was detected in soil at five locations, with the maximum concentrations detected at SB-12 (7.1 mg/kg) and SB-10 (3 mg/kg), located in the central and western portions of the Site, respectively. Cyanide was detected at the remaining three locations below 1.0 mg/kg.

Thallium was detected in soil at five locations, with the maximum concentration detected at SB-9 (0.11 mg/kg) located in the western portion of the Site.

Antimony was detected in soil at 10 locations with the highest concentrations detected at SB-20 (75.4 mg/kg), TP-6 (67.6 mg/kg), ERM-105D (62.3 mg/kg), SB-16 (58 mg/kg), SB-13 (44.7 mg/kg), SB-4 (36.6 mg/kg), and SB-6 (35.3 mg/kg). These samples were all located on or near the Tongue Area or in the north central portion of the Site. One soil sample collected Outside the Fence, SB-24, contained antimony, at a concentration of 0.93 mg/kg. No other sample collected Outside the Fence contained antimony.

Distribution of Radiological Parameters in Soil

This section summarizes analytical results and interpretations based upon information collected by the USACE for radiological parameters in soil. Soil samples were collected at 135 locations for laboratory analysis of radiological parameters. Table 6F of the RI contains a summary of laboratory analytical results for radiological parameters analyzed as part of the Focused Site Inspection performed by Cabrera, the contractor for the USACE. For the purposes of displaying the nature and extent of radiological soil impacts, the distributions of uranium (^{235}U and ^{238}U) and radium (^{226}Ra and ^{228}Ra), have been plotted on Figure 15 of the RI (provided by Cabrera) as representative indicator compounds. Due to the variability of concentrations of radiological parameters detected, the scale of contaminant concentrations is different for each parameter. As shown on these figures, both radium and uranium were detected across the majority of the Site. The highest concentrations of radiological parameters are summarized in the following table:

Parameter	Location	Depth (feet bgs)	Concentration (pCi/g)
^{235}U	1274	1 - 3	730
	1278	1 - 3	311
	1224	1 - 3	185
	1096	1 - 3	174
	1286	1 - 3	90
	1136	1 - 3	46.1
^{238}U	1274	1 - 3	14,200
	1224	1 - 3	6,900
^{226}Ra	1281	0 - 2	1,600
	1100	1 - 3	730.99
^{228}Ra	1274	1 - 3	4.6
	1273	1 - 3	4.25

As shown on Figure 15 of the RI, elevated concentrations of uranium and radium were detected in discrete areas of the Site. The highest concentration of ^{228}Ra (4.6 picocuries per gram (pCi/g)) is collocated with the highest concentration of ^{235}U and ^{238}U (730 and 14,200 pCi/g, respectively) in the southeastern portion of the Site, near borings 1273 and 1274. However, the highest concentrations of ^{226}Ra detected at borings 1281 (1,600 pCi/g) and boring 1100 (730.99 pCi/g) in the northern and eastern edges of Wetland #2 are not collocated with the highest concentrations of either ^{235}U or ^{238}U.

Groundwater

Groundwater samples were collected from 25 monitoring wells in 1992 and from 30 monitoring wells in 2002 as part of the RI. The following subsections present the

distribution of contaminants in groundwater. Figure 16 of the RI displays the distribution of organic compounds detected in groundwater in the Site Interior and Outside the Fence. Tables 7A, 7B, and 7C of the RI contain summaries of VOCs, SVOCS, and inorganics, respectively, detected in groundwater at the Site. In general, groundwater analytical data indicated the following:

- VOCs detected in groundwater were primarily chlorinated solvents and were located in three discrete areas. The highest concentration of total VOCs are located at well cluster ERM-107, located upgradient of the Shpack Site on the ALI Landfill.
- The distribution of VOCs in samples collected from monitoring wells in the Site Interior and Outside the Fence relative to concentrations of VOCs in perimeter/off-site monitoring wells indicate that impacts were limited to areas inside the Site Interior and do not appear to be migrating Outside the Fence.
- The elevated levels of SVOCs detected in soil do not appear to have significantly impacted groundwater quality.

A summary of the groundwater data is presented below.

Distribution of VOCs in Groundwater

VOCs were detected at 25 of the 30 groundwater sampling locations at the Site (Figure 16 of the RI). Concentrations of total VOCs were detected at relatively low levels (below 100 micrograms per liter (ug/l)) at 20 of the 25 locations where total VOCs were detected. The five detections of total VOCs greater than 100 ug/l primarily contain chlorinated solvents (e.g. TCE, 1,2-DCE, cis-1,2-DCE, etc.) and were located in three discrete areas, as follows:

Tongue Area – One well triplet, ERM-107, located on the ALI Landfill, upgradient of the Tongue Area, contained three of the five concentrations greater than 100 ug/l and the highest concentration detected, 173,000 ug/l (ERM-107M, Phase IA).

- Total VOCs were detected in ERM-107M at a concentration of 11,650 ug/l. Earlier samples at this location contained primarily TCE (84,000 ug/l) and PCE (70,000 ug/l), whereas, the more recent sample contained primarily cis-1,2-DCE (9,800 ug/l) and vinyl chloride (1,200 ug/l). The presence of these compounds likely indicates that degradation of TCE and PCE is occurring.
- Monitoring well ERM-107D contained the second highest total VOC concentration (4,150 ug/l). This sample contained PCE at a concentration of 3,400 ug/l and TCE at a concentration of 600 ug/l.
- Monitoring well ERM-107S contained the fourth highest total VOC concentration (362 ug/l). This sample contained PCE at 180 ug/l and TCE at 140 ug/l.
- Downgradient monitoring well cluster ERM-103 did not contain concentrations of chlorinated solvents exceeding 100 ug/l.

North Central Interior – The third highest concentration of total VOCs detected in groundwater was at ERM-105D (5,227 ug/l). This sample contained cis-1,2-DCE at a concentration of 5,000 ug/l and vinyl chloride at a concentration of 200 ug/l. The presence of these compounds likely indicates that degradation of chlorinated solvents is occurring. Downgradient monitoring well ERM-102D did not contain detectable concentrations of chlorinated solvents or degradation byproducts.

Eastern Interior – The final concentration of total VOCs exceeding 100 ug/l was located in the eastern portion of the Site Interior at DOE-4 (700 ug/l). This sample contained cis-1,2-DCE at a concentration of 200 ug/l and vinyl chloride at a concentration of 500 ug/l. The presence of these compounds likely indicates that degradation of chlorinated solvents is occurring. The nearest downgradient monitoring wells contain either low levels of chlorinated solvents (ERM-34D – 4.72 ug/l) or do not contain detectable concentrations of chlorinated solvents or degradation byproducts.

In summary, total VOCs were detected at low levels across the entire Site Interior and at elevated levels in three distinct areas.

Distribution of SVOCs in Groundwater

SVOCs were detected in groundwater at eight of the 25 locations analyzed for SVOCs (Figure 16 of the RI). SVOCs were only detected in monitoring wells located in the Site Interior. In general, the non-soluble SVOC compounds detected in soil in the Site Interior have not leached to groundwater Outside the Fence.

The maximum concentration of total SVOCs detected on Site was at monitoring well ERM-105S at a concentration of 245 ug/l. (Table 7B of the RI). Total SVOCs were detected in this well at a concentration of 1.65 ug/l, which is more representative of current Site conditions. The types of SVOC compounds detected in this sample are consistent with those compounds detected in soil at this location.

The maximum concentration of total SVOCs detected during the Phase IB was 117.2 ug/l at monitoring well ERM-107M, located on the ALI Landfill, upgradient of the Site. The majority of SVOC compounds detected in this sample are phenolic compounds that are relatively soluble.

Distribution of Pesticides and PCBs in Groundwater

Pesticides and PCBs were not detected in any of the 25 groundwater samples collected in the early round of sampling. Therefore, none of the groundwater samples collected during the later rounds were analyzed for PCBs or pesticides.

Distribution of Inorganics in Groundwater

In general, the concentrations of most inorganics detected in groundwater during the 2002-2003 sampling event are one to three orders of magnitude lower than the concentrations detected in groundwater during the 1992 sampling event. The recent sampling is most representative of current groundwater conditions at the Site.

The following table summarizes the maximum concentration of metals and cyanide detected in groundwater, the location of the maximum concentration and the area of the Site where the maximum value was detected.

Parameter	Maximum Concentration (ug/l)	Location	Area of Site
Antimony	0.96	ERM-107M	ALI Landfill
Arsenic	69.6	ERM-32D	Power line Access Road
Barium	3760	ERM-105S	Site Interior (north)
Beryllium	75.1	ERM-103D	Tongue Area
Cadmium	70.9	ERM-103S	Tongue Area
Chromium	203	ERM-103D	Tongue Area
Lead	68.1	ERM-107M	ALI Landfill
Manganese	18600	ERM-32D	Power line Access Road
Mercury	0.19*	ERM-109B	ALI portion of the Shpack
Nickel	15300	ERM-103S	Tongue Area
Selenium	4.7*	ERM-107D	ALI Landfill
Silver	4.3	ERM-105D	Site Interior (north)
Vanadium	85.4	ERM-107D	ALI Landfill
Zinc	15800	ERM-103S	Tongue Area
Cyanide	17.3*	DOE-3	Outside the Fence (north)

Notes:
* - Compound was only detected at this location during 2002-2003 sampling round

As shown in the above table, the majority of the maximum concentrations of inorganics detected in groundwater are isolated to either the Site Interior in Wetland #2, or Outside the Fence, adjacent to the Tongue Area. The inorganic constituents of concern detected in groundwater are consistent with those detected in soil.

The concentrations of inorganics detected in background groundwater sampling locations, ERM-102S, ERM-102D, and ERM-104S were one to three orders of magnitude lower than the maximum concentration detected on Site.

Distribution of Radiological Parameters in Groundwater

This section summarizes analytical results and interpretations provided by the USACE for radiological parameters in groundwater. Table 7D of the RI lists a summary of radiological parameters detected in groundwater in the Site Interior and Outside the Fence. Radiological parameters were detected at all groundwater sampling locations. The following table summarizes the location of the highest detections of Gross Alpha, Gross Beta, Radium, and Uranium detected on Site.

Parameter	Maximum Detection	Location	Area of Site
Gross Alpha	90 pCi/l	DOE-7	Eastern Interior
Gross Beta	143 pCi/l	ERM-107S	The ALI Landfill
Radium 228	7.5 pCi/l	ERM-107M	The ALI Landfill
Uranium 232	13 pCi/l	ERM-106S	Northern Interior
Uranium 234	118 pCi/l	DOE-7	Eastern Interior
Uranium 235	9.4 pCi/l	DOE-7	Eastern Interior
Uranium 238	15 pCi/l	DOE-7	Eastern Interior

Gross Alpha was detected at the same order of magnitude as the maximum concentration at four locations, ERM-103B (22.9 pCi/l), ERM-103D (34 pCi/l), ERM-107M (18 pCi/l), and ERM-32D (29.2 pCi/l). These detections were located in the Tongue Area (ERM-103), on the ALI Landfill (ERM-107 and on the power line access road located east of the Shpack Site (ERM-32S). All of these samples were either located in the eastern/southeastern portion of the Shpack Site, or east of the Shpack Site.

Radium was detected at 20 locations at the same order of magnitude as the highest concentration detected during this sampling round. Based on the detections of radium in groundwater, radium was located in all areas of the site at relatively consistent concentrations. This distribution of radium in groundwater is consistent with the distribution of radium in soil.

The second highest concentrations of ^{234}U and ^{238}U were detected in the Tongue Area at ERM-103B (^{234}U = 22.6 pCi/l and ^{238}U = 9.9 pCi/l) and ERM-103D (^{234}U = 20.6 pCi/l and ^{238}U = 10.7 pCi/l). Concentrations of ^{234}U and ^{238}U were not identified in any other sample at this magnitude.

Surface Water

A total of 21 surface water samples were submitted for analysis of VOCs, SVOCs, PCBs and pesticides. Surface water at the site was defined as areas of seasonal standing water. Figure 17 of the RI displays the distribution of organic compounds detected in surface water in the Site Interior and Outside the Fence. As noted above, surface water located within the Site Interior was essentially isolated from surface water located Outside the Fence. In addition, surface water transport from the Site Interior was restricted due to topographical features inhibiting overland flow of surface water from the Site Interior to surface waters Outside the Fence. Tables 8A, 8B, 8C, and 8D of the RI contain a summary of VOCs, SVOCS, PCB/pesticides and inorganics, respectively, detected in surface water at the Site.

In general, surface water analytical data indicate the following:

- VOCs were detected at low levels in surface water in the Site Interior and were not detected Outside the Fence
- SVOCs were detected in surface water in the Site Interior in later sampling and were generally detected at concentrations less than 1.0 ug/l.
- Pesticides were detected in surface water in the Site Interior in later sampling and are consistent with pesticides detected in soil.
- PCBs were detected in one surface water sample collected during the early sampling rounds however, PCBs were not detected in later sampling
- The highest concentrations of metals in surface water were located Outside the Fence, immediately adjacent to the Tongue Area.

A summary of the compounds detected in surface water is presented in the following subsections.

Distribution of VOCs in Surface Water

A total of 21 surface water samples were submitted for analysis of VOCs from both the Site Interior and Outside theFence (Figure 17 of the RI). VOCs were detected at nine locations, with the maximum concentration of 174 ug/l total VOCs detected at SW-1 (Table 8A of the RI). The predominant compound detected in this sample was acetone at a concentration of 170 ug/l, which was not identified during later sampling.

The most frequently detected compound was cis-1,2-DCE, at four locations, SW-1 (1.2 ug/l), SW-15 (5.6 ug/l), SW-18 (0.38 ug/l), and SW-19 (19 ug/l). All of these surface water sampling locations were in the Site Interior wetlands.

Distribution of SVOCs in Surface Water

SVOCs were detected in surface water at six of the 14 locations sampled (Figure 17 of the RI). SVOCs were not detected at any of the sampling locations Outside the Fence (SW-4, SW-6, SW-7, SW-8 and SW-9) with the exception of SW-5, where total SVOCs were detected at 0.5 ug/l. The maximum concentration of SVOCs detected in the Site Interior is 4.5 ug/l at SW-1. The total SVOC concentration of 4.5 ug/l detected at SW-1 in earlier sampling was not reproduced at SW-1 during later sampling.

Distribution of Pesticides and PCBs in Surface Water

Pesticides were detected at three of the 14 sampling surface water locations, SW-15, SW-16 and SW-18, located in the Site Interior. The maximum concentration of pesticides was 0.02 ug/l at both SW-16 and SW-18. Pesticides were not detected in surface water at any sampling location Outside the Fence.

PCBs were only detected at one surface water sampling location (SW-1) during the early sampling at a concentration of 0.43 ug/l (Figure 17 of the RI). This detection was not confirmed in the surface water sample collected at this location during later sampling rounds. PCBs were not detected in any surface water sampling location in the Site Interior or Outside the Fence.

Distribution of Inorganics in Surface Water

A total of 23 surface water samples from the Site Interior and Outside the Fence were submitted for laboratory analysis of total and dissolved inorganics (metals and cyanide [Table 8D of the RI]). Inorganics were detected at all sampling locations in the Site Interior and Outside the Fence. Because the analysis of unfiltered samples includes the suspended particles in the water, higher levels of inorganics are expected in these samples than the filtered samples. Total inorganic concentrations are generally one to three orders of magnitude greater than dissolved concentrations (Table 8D of the RI). The remainder of this section presents the results of total inorganics findings only.

The highest concentrations of inorganics detected in surface water were observed Outside the Fence adjacent to the Tongue Area at SW-5, and in the Site Interior in Wetlands #1 and #2. A summary of the various inorganics detected in surface water is provided below.

The highest concentration of nine metals were detected at one sampling location, SW-5, located Outside the Fence, adjacent to the Tongue Area, as follows:

- Beryllium – 1,480 ug/l
- Cadmium – 121 ug/l
- Chromium - 13,300 ug/l
- Lead – 868 ug/l
- Mercury – 41.1 ug/l
- Nickel – 235,000 ug/l
- Silver – 35.9 ug/l
- Vanadium – 618 ug/l

- Zinc - 49,900 ug/l

The concentration of these nine metals are one to three orders of magnitude lower in all other samples collected at the Shpack Site. The concentration of inorganics in surface water detected at SW-5 is consistent with the concentrations detected in soil in the Tongue Area.

The highest concentration of antimony was detected in Wetland #2 in the Site Interior at locations SW-1 (24.5 ug/l – Phase IA) and SW-2 (36 ug/l) and Outside the Fence, adjacent to the Tongue Area at SW-5 (14.9 ug/l). These concentrations are one to two orders of magnitude above the concentration of antimony detected at any other sampling locations either in the Site Interior or Outside the Fence.

The highest concentration of arsenic in surface water was detected in sampling location SW-4, located south of the Site, at a concentration of 31.4 ug/l. The next highest concentration of arsenic was detected adjacent to the Tongue Area at SW-5 at a concentration of 10.8 ug/l.

The highest concentrations of barium in surface water were detected in the Site Interior in Wetlands #1 and #2 at SW-1 (7,500 ug/l), SW-2 (4,840 ug/l), SW-15 (1,300 ug/l), SW-17 (2,430 ug/l), SW-18 (2,530 ug/l) and SW-19 (1,690 ug/l). Barium was not detected at any other sampling location above 1,000 ug/l.

The highest concentration of selenium in surface water was detected at SW-16 (8.6 ug/l), located in Wetland #2, in the Site Interior. The next highest concentration of selenium was detected in sampling locations SW-4 (6.2 ug/l) and SW-10 (8.5 ug/l) located south of the Site.

Distribution of Radiological Parameters in Surface Water

This section summarizes analytical results and interpretations for radiological parameters in surface water. Table 8 of the RI lists a summary of radiological parameters detected in surface water Outside the Fence. Radiological parameters were detected at all surface water sampling locations. The following table summarizes the location of the highest detections of Gross Alpha, Gross Beta, Radium, and Uranium detected Outside the Fence.

Parameter	Maximum Detection	Location	Sample Location
Gross Alpha	3.6 pCi/l	SW-14	Chartley Swamp (SE)
Gross Beta	12 pCi/l	SW-14	Chartley Swamp (SE)
Radium 226	220 pCi/l	SW-13	Chartley Swamp (SE)
Radium 228	4.33 pCi/l	SW-11	Near the ALI Landfill (SE)
Uranium 232	11.6 pCi/l	SW-12	Adjacent to Tongue (SE)
Uranium 234	3.26 pCi/l	SW-5	Adjacent to Tongue (SE)
Uranium 235	0.29 pCi/l	SW-5	Adjacent to Tongue (SE)
Uranium 238	2.66 pCi/l	SW-5	Adjacent to Tongue (SE)

Gross Alpha was only detected at one location (SW-14). This detection is located in Chartley Swamp southeast of the Site along the power line access road. Gross Alpha was

not detected in any of the other surface water samples analyzed for radiological parameters.

Radium was detected at all seven locations at the same order of magnitude as the highest concentration detected in surface water. Radium in surface water outside of the site was detected at relatively consistent concentrations. The distribution of radium in surface water is consistent with the distribution of radium in both soil and groundwater.

The highest concentrations of ^{234}U and ^{238}U were detected immediately adjacent to the Tongue Area at SW-5 (^{234}U = 3.26 pCi/l and ^{238}U = 2.66 pCi/l). The second highest concentrations ^{234}U and ^{238}U were detected downgradient of DOE-7 at SW-6 (^{234}U = 1.93 pCi/l and ^{238}U = 1.92 pCi/l) and southeast of the site at SW-11 (^{234}U = 1.18 pCi/l and ^{238}U = 1.04 pCi/l).

Sediment

A total of 14 sediment samples were collected from in the Site Interior and Outside the Fence were analyzed for VOCs, SVOCs, PCBs and pesticides. In general, organic compounds were detected at low levels Outside the Fence and at elevated concentrations in the Site Interior. A summary of the distribution of each class of compounds is provided in the following subsections. Figure 17 of the RI displays the distribution of organic compounds detected in sediments in the Site Interior and Outside the Fence. Tables 9A, 9B, 9C, 9D and 9E of the RI contain summaries of VOCs, SVOCS, PCB/pesticides, inorganics, and general chemistry, respectively, detected in sediments at the Site.

Distribution of Total VOCs in Sediment

Total VOCs were detected at 10 of the 14 sediment sampling locations, with the highest concentrations detected in the central wetlands in the Site Interior (Figure 17 of the RI). The two highest total VOC concentrations in sediment are 13,107 ug/kg and 6,436 ug/kg at SW-18 and SW-15, respectively (Table 9A of the RI). The predominant compounds detected in these samples are TCE (13,000 ug/kg) in SW-18 and cis-1,2-DCE (6,400 ug/kg) in SW-15. The next highest concentration of total VOCs detected in any sediment sample is 52 ug/kg, detected in SW-8.

Distribution of Total SVOCs in Sediment

Total SVOCs were detected at all 14 sediment sampling locations, with the highest concentration detected in Wetland 2 in the Site Interior (Figure 17 and Table 9B of the RI). All samples collected from Wetland 2 contained total SVOCs at concentrations exceeding 10,000 ug/kg, as follows:

- SW-15 = 29,230 ug/kg;
- SW-16 = 18,246 ug/kg;
- SW-17 = 12,804 ug/kg; and
- SW-18 = 200,810 ug/kg;

No other sediment samples collected in the Site Interior or Outside the Fence contained total SVOCs at concentrations exceeding 1,000 ug/kg except at SW-19 where total SVOCs were detected at a concentration of 1,211 ug/kg.

Distribution of Pesticides in Sediment

Pesticides were detected at five of the 14 sediment sampling locations analyzed. (Figure 17 and Table 9C of the RI). Pesticides were not detected in any samples collected from Outside the Fence (SW-4, SW-5, SW-6, SW-7, SW-8, and SW-9). The highest concentration of total pesticides detected in sediment in the Site Interior is 1,970 ug/kg at SW-18, located in Wetland 2. The next highest concentration of total pesticides is two orders of magnitude lower, 92 ug/kg at SW-15, also located in Wetland 2.

Distribution of PCBs in Sediment

PCBs were detected at seven of the 14 sediment sampling locations collected (Figure 17 and Table 9C of the RI). PCBs were not detected in any samples collected from Outside the Fence (SW-4, SW-5, SW-6, SW-7, SW-8, and SW-9). The highest concentration of total PCBs detected in the Site Interior is 91,000 ug/kg at SW-18, in Wetland #2. The next highest concentration of total PCBs is two orders of magnitude lower, 370 ug/kg at SW-17, also located in Wetland #2.

Distribution of Inorganics in Sediment

A total of 23 sediment sampling locations from the Site Interior and Outside the Fence were submitted for laboratory analysis of total and dissolved inorganics (Table 9D of the RI). Inorganics were detected at all sediment sampling locations in the Site Interior and Outside the Fence.

The following table summarizes the maximum concentration of metals and cyanide detected in sediment on site, the location of the maximum concentration and the area of the site where the maximum was detected.

Parameter	Max. Concentration (ug/kg)	Location	Area of Site
Antimony	618	SW-18	Wetland #2
Arsenic	38	SW-7	Chartley Swamp
Barium	3,570	SW-18	Wetland #2
Beryllium	98.5	SW-12	Adjacent to Tongue Area
Cadmium	82.1	SW-12	Adjacent to Tongue Area
Chromium	1,380	SW-12	Adjacent to Tongue Area
Lead	2,970	SW-16	Wetland #2
Manganese	1,980	SW-18	Wetland #2
Mercury	4.4	SW-12	Wetland #2
Nickel	26,200	SW-12	Adjacent to Tongue Area
Selenium	3.3	SW-14	Power line Access Road
Silver	454	SW-18	Wetland #2
Thallium	0.15	SW-5	Wetland #1/Tongue Area
Vanadium	127	SW-7	Chartley Swamp
Zinc	20,800	SW-12	Adjacent to Tongue Area
Cyanide	2.1	SW-18	Wetland #2

As shown in the above table, the majority of the maximum inorganic concentrations detected in sediment were located either in Wetland #2, or Outside the Fence, adjacent to the Tongue Area. The concentration of inorganics in sediment detected in background sampling locations, SW-10, SW-11, SW-22 and SW-23 were one to three orders of magnitude lower than the maximum concentration detected on Site.

Residential Wells

In 2001, 2002, and 2003, samples of drinking water were collected from residential wells near Shpack as part of Phase IB investigation activities. The analytical program was designed to evaluate potential impacts to private drinking water supply wells. Figure 3 shows the location of the wells sampled, as well as the location of the two closest wells, Union Road House 1 and Union Road House 2. Water samples were collected from wells at following residences:

Town of Attleboro	Well Depth	Town of Norton	Well Depth
Peckham Street, House 1	unknown	Union Road, House 1	unknown
Peckham Street, House 2	unknown	Union Road, House 2	14 feet
Peckham Street, House 3	unknown	N. Worcester Street, House 1	180 feet
Peckham Street, House 4	unknown	Maple Street, House 1	75 feet
		Maple Street, House 2	140 feet
		Maple Street, House 3	200 feet
		Maple Street, House 4	200 feet
		Maple Street, House 5	unknown
		Maple Street, House 6	unknown

The following subsections present a summary of constituents identified in drinking water near Shpack. Figure 4 of the RI displays residential well sampling locations with respect to Shpack. Table 10 of the RI summarizes analytical results of residential well samples collected as part of the Phase IB Investigation. A summary of the residential drinking water data is presented below.

Distribution of VOCs in Residential Wells

A total of six VOCs were detected at six of the 14 residential well sampling locations (Table 10 of the RI). VOCs were not detected above EPA Maximum Contaminant Limits (MCLs) in any of the drinking water samples. In general, VOCs were detected at low levels in the residential drinking water wells. As shown on Table 10 of the RI, five of the six VOCs detected in residential wells were detected in only one sampling event and have not been repeated in previous or subsequent sampling events. One VOC, methyl-tert butyl-ether (MTBE) has been detected in four of the six residential drinking water wells at concentrations ranging from 0.68 ug/l (Peckham Street, House 3) to 37 ug/l (Peckham Street, House 2). With the exception of Union Street, House 1, the residential wells where MTBE has been detected are not associated with the Shpack Site. MTBE was detected in groundwater at the Shpack site at five locations.

Distribution of Inorganics in Residential Wells

Table 10 of the RI displays inorganic analytical results for residential drinking water samples collected as part of the RI in 2001, 2002, and 2003. In April 2003, samples collected from four wells were believed to contain four separate inorganic compounds exceeding EPA MCLs. Based on these results, re-sampling of these wells was performed in July and August 2003, as summarized in the following table:

Location	Compound	MCL	April 2003	July 2003	August 2003
N. Worcester, House 1	Arsenic	0.01	0.0113	0.0136	0.0164
Maple Street, House 5	Cadmium	0.005	0.204	ND	ND
Union Street, House 1	Lead	0.015	0.0008	ND	ND
Union Street, House 2	Antimony	0.006	0	ND	ND

Notes:
All compounds reported in milligrams per liter (mg/l)
MCL = Maximum Contaminant Limit
ND = Compound not detected

The detection of arsenic at North Worcester Street, House 1 is not believed to be related to Shpack as this location is across Chartley Pond and situated topographically and hydrologically upgradient of Shpack. The residential well sample collected at Maple Street, House 5 was most likely the result of a laboratory error and was not reproducible.

In addition, the MCL exceedences at the other two residential well sampling locations were the result of data transcription errors, were re-sampled and confirmed to be free of MCL exceedences. One sample containing manganese was originally reported in the RI at 840 ug/l at Union Street, House 2. This was later determined to be a transcription error. The maximum level of manganese detected in this residential well was 170 ug/l. This detected manganese level results in noncancer hazard quotients of 0.19 and 0.66 for current adult and small child receptors, respectively, which are both below EPA's noncancer threshold of 1.0. Please refer to the revised Tables 3.10 RME, 7.4 RME, and 7.5 RME for the corrected tables within the "Human Health Risk Assessment-Letter Addendum", dated September 15, 2004 by Metcalf and Eddy for further detail.[1]

[1]Water levels in monitoring wells screened in the shallow zone at the Shpack site suggest that groundwater flow is semi-radially outward toward the northwest, north, northeast, east, and southeast. The only direction in which water levels are higher immediately off the site is to the southwest, beneath the ALI Landfill. Although the groundwater contours for the shallow zone suggest that flow would be toward the private water supply wells north of the site at Union Road House 1 and Union Road House 2, the shallow groundwater flow is apparently predominantly downward at the site, into the deeper overburden. This concept is supported by both water level and water quality measurements. The positions of these two homes relative to the site (in particular their close proximity to the site) and to highly contaminated wells make them potentially vulnerable to future contamination if hydrologic conditions change (e.g., water levels in nearby ponds and wetlands change, drainage characteristics at the Shpack or ALI sites are altered). Therefore, EPA has determined :
that a sufficient threat exists at the Site to support installion of a waterline to these two houses. This determination is consistent with EPA's 1988 "Guidance Document for Providing Alternate Water Supplies":

> "In addition, remedial action may be taken based on the threat of future contamination in cases where these criteria are not yet exceeded ("MCLs"). If potable wells are not currently contaminated, it must be determined they will be threatened with contamination before a final remedy addressing ground water contamination can be implemented."

Distribution of Radiological Parameters in Drinking Water

Table 10 of the RI lists a summary of radiological parameters detected in residential drinking water in the vicinity of the Shpack Site. Radiological parameters were not detected above EPA MCLs in any of the residential drinking water samples collected during the RI. Gross Alpha and Beta were detected at approximately one order of magnitude less than Gross Alpha and Gross Beta in groundwater at the Shpack Site. Radium was detected in residential drinking water at the same order of magnitude as Radium detections in groundwater at Shpack. Total Uranium was detected in residential drinking water at the same order of magnitude or an order of magnitude less than detected in groundwater at Shpack.

Other Investigation Activities

This section summarizes the results of other field investigation activities performed at Shpack as part of the RI.

Test Pit Investigation Results

A total of 10 test pits were excavated in the Tongue Area to evaluate the physical and chemical nature of waste materials in this area. Based on the test pit program, landfill materials in the Tongue Area are approximately 6 to 8 feet thick and consist of rubber garden hose, concrete, ash (gray, purple, and yellow in color), metal debris, cinders, wood debris, unidentified burnt debris, and crushed PVC. The materials were mixed with brown-orange, fine sand, silt, and clay, with some coarse gravel, and some gray clay lenses. Test pit logs are included in Appendix A of the RI.

As shown on Table 6 of the RI, VOCs, SVOCs, PCBs, pesticides and inorganics were detected in all soil samples collected from the Tongue Area test pits. In addition, some of the highest concentrations of inorganic compounds were detected in soil samples collected from test pits in the Tongue Area. Radiological screening of soils excavated during test pit activities did not indicate elevated levels of radionuclides in soil in the Tongue Area. This is consistent with radiological analysis of soil samples collected from soil borings collected in this area by the USACE (Table 6F of the RI).

Tar Pit Delineation Results

As part of the RI field activities, the extent of tar material present on the surface of the Site was evaluated (Figure 3 of the RI). The depth of the tar was evaluated using sections of one-inch diameter PVC marked with depth measurements. The lateral extent of the tar area was measured using a tape measure.

Based on the Tar Pit delineation, the tar material measures approximately 0.3 feet to 0.8 feet deep and extends over an area approximately 12 feet wide by 27 feet long. A graphical representation of the lateral and vertical extent of the tar pit area is included as Figure 18 of the RI.

F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

1. Current Use

The land use surrounding the Site is predominantly rural/low-density residential in nature. The ALI Landfill is located directly west of the Site. Groundwater is currently used as drinking water by two residents close to the Site. This is consistent with the State's use and value determination that designates this groundwater as "high" use and value based primarily upon the fact that this groundwater is currently being used for drinking water at these two houses.

2. Future Use

As part of the FS, EPA evaluated each alternative based upon four possible future use scenarios. These scenarios are as follows:

- Recreational user
- Adjacent resident w/out groundwater exposure
- Adjacent resident w/ groundwater exposure
- On-site resident

Based upon EPA's review of the Site and input from the community and local Town officials, the reasonably anticipated future use of the site could be either the recreational scenario or the adjacent resident scenario. A great many comments have been received from the community supporting the recreational scenario. However, because there is an adjacent resident in existence and the area is zoned to allow that use to continue, EPA believes this scenario is the most realistic future use scenario. This decision is not contrary to the wishes expressed by many in the community that the Site be cleaned up to allow recreational use in the future. The adjacent resident scenario assumes greater exposure to contamination than the recreational scenario and, therefore, will require greater quantities of waste material to be addressed by the remedy. As a result, by cleaning up the Site to an adjacent resident scenario and addressing unacceptable ecological risks, the remedy will be sufficiently protective to allow recreational uses as well.

EPA has also determined that on-site residential use of the site is highly unlikely based upon several factors. First, a large portion of the Site consists of wetlands which are not conducive to residential development. In addition, the Site is adjacent to the ALI Landfill. The Site is also bisected by high voltage power lines. All of these factors make residential development undesirable and therefore not realistic for residential future use.

The selected remedy does not address Site groundwater (See Section D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION for this determination).

G. SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The public health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances which, given the specifics of the site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. The ecological risk assessment followed the eight-step process guidance for Superfund.

A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

1. Human Health Risk Assessment

Sixty-one of the more than 125 chemicals detected at the site were selected for evaluation in the human health risk assessment as chemicals of potential concern. The chemicals of potential concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment and can be found in Tables 2.1 through 2.14 of the risk assessment (M&E, 2004). From this, a subset of the chemicals were identified in the Feasibility Study as presenting a significant current or future risk and are referred to as the chemicals of concern in this ROD and summarized in Tables G-1 through G-5 for surface water, sediment, surface soil, subsurface soil, and groundwater, respectively. These tables contain the exposure point concentrations used to evaluate the reasonable maximum exposure (RME) scenario in the baseline risk assessment for the chemicals of concern. Estimates of average or central tendency exposure concentrations for the chemicals of concern and all chemicals of potential concern can be found in Tables 3.1 through 3.14 of the risk assessment (M&E, 2004).

Potential human health effects associated with exposure to the chemicals of potential concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site.

The Site consists of a central fenced portion, the more recently-fenced "tongue" area, unfenced areas at the perimeter of the fencing, the former Shpack residence, and unfenced wetland areas, including Chartley Swamp. The Site is in a predominantly rural, low density residential area. The ALI Landfill landfill abuts the site to the west. A utility right-of-way with power lines crosses

Table G-1

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Minimum	Maximum					(1)
Site-wide	Benzo(a)pyrene	0.2	0.4	ug/L	2 / 14	0.4	ug/L	Max
	Benzo(b)fluoranthene	0.2	0.3	ug/L	2 / 14	0.3	ug/L	Max
	Benzo(k)fluoranthene	0.1	0.4	ug/L	2 / 14	0.4	ug/L	Max
	Aroclor-1254	0.43	0.43	ug/L	1 / 14	0.41	ug/L	95% UCL - NP
	Beryllium	0.785	1480	ug/L	6 / 21	381	ug/L	95% UCL - NP
	Chromium	0.57	13300	ug/L	15 / 21	3436	ug/L	95% UCL - NP
	Nickel	9.5	235000	ug/L	21 / 21	61363	ug/L	95% UCL - NP

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); Arithmetic Mean (Mean)

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface water (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in surface water). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that inorganic chemicals are the most frequently detected COCs in surface water at the site. The 95% UCL on the arithmetic mean was used as the EPC for the inorganic compounds beryllium, chromium, and nickel and for Aroclor-1254. However, due to the limited amount of sample data available for benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene, the maximum detected concentration was used as the default EPC.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-2

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
Site-wide	Aroclor-1254	0.035	84	mg/Kg	8 / 22	20	mg/Kg	95% UCL - NP

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); Arithmetic Mean (Mean)

The table represents the chemical of concern (COC) and exposure point concentration (EPC) for the COC detected in sediment (i.e., the concentrations that will be used to estimate the exposure and risk for the COC in sediment). The table includes the range of concentrations detected for the COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that Aroclor-1254 is the only COC in sediment at the site. The 95% UCL on the arithmetic mean was used as the EPC for Aroclor-1254.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-3

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Minimum	Maximum					(1)
Combined On-Site	Benzo(a)anthracene	0.048	50	mg/Kg	15 / 27	14	mg/Kg	95% UCL - NP
	Benzo(a)pyrene	0.016	48	mg/Kg	19 / 27	8.5	mg/Kg	95% UCL - T
	Benzo(b)fluoranthene	0.008	35.5	mg/Kg	19 / 27	4.5	mg/Kg	95% UCL - T
	Dibenz(a,h)anthracene	0.014	3.5	mg/Kg	5 / 27	1.2	mg/Kg	95% UCL - NP
	Dioxin TEQ	0.00003	0.00047	mg/Kg	3 / 3	0.00047	mg/Kg	Max
	Arsenic	0.17	29.3	mg/Kg	27 / 27	15	mg/Kg	95% UCL - T
	Nickel	5.7	48950	mg/Kg	27 / 27	13941	mg/Kg	95% UCL - NP
	Uranium, total	0.78	43383	mg/Kg	71 / 71	3902	mg/Kg	95% UCL - NP
	Ra-226	0.39	1600	pCi/g	119 / 133	77	pCi/g	95% UCL - NP
	U-234	0.22	5340	pCi/g	71 / 71	557	pCi/g	95% UCL - NP
	U-235	0.03	730	pCi/g	69 / 133	40	pCi/g	95% UCL - NP
	U-238	0.25	14200	pCi/g	71 / 71	1277	pCi/g	95% UCL - NP
Adjacent Residence	Benzo(a)anthracene	0.048	50	mg/Kg	15 / 27	14	mg/Kg	95% UCL - NP
	Benzo(a)pyrene	0.016	48	mg/Kg	19 / 27	8.5	mg/Kg	95% UCL - T
	Benzo(b)fluoranthene	0.008	35.5	mg/Kg	19 / 27	4.5	mg/Kg	95% UCL - T
	Dibenz(a,h)anthracene	0.014	3.5	mg/Kg	5 / 27	1.2	mg/Kg	95% UCL - NP
	Dioxin TEQ	0.00003	0.00047	mg/Kg	3 / 3	0.00047	mg/Kg	Max
	Arsenic	0.17	29.3	mg/Kg	27 / 27	15	mg/Kg	95% UCL - T
	Nickel	5.7	48950	mg/Kg	27 / 27	13941	mg/Kg	95% UCL - NP
	Uranium, total	0.78	43383	mg/Kg	71 / 71	3902	mg/Kg	95% UCL - NP
	Ra-226	0.39	1600	pCi/g	119 / 133	77	pCi/g	95% UCL - NP
	U-234	0.22	5340	pCi/g	71 / 71	557	pCi/g	95% UCL - NP
	U-235	0.03	730	pCi/g	69 / 133	40	pCi/g	95% UCL - NP
	U-238	0.25	14200	pCi/g	71 / 71	1277	pCi/g	95% UCL - NP
On-Site Residence	Benzo(a)anthracene	0.048	50	mg/Kg	15 / 27	14	mg/Kg	95% UCL - NP
	Benzo(a)pyrene	0.016	48	mg/Kg	19 / 27	8.5	mg/Kg	95% UCL - T
	Benzo(b)fluoranthene	0.008	35.5	mg/Kg	19 / 27	4.5	mg/Kg	95% UCL - T
	Dibenz(a,h)anthracene	0.014	3.5	mg/Kg	5 / 27	1.2	mg/Kg	95% UCL - NP
	Indeno(1,2,3-cd)pyrene	0.008	32	mg/Kg	18 / 27	3.5	mg/Kg	95% UCL - T
	Dioxin TEQ	0.00003	0.00047	mg/Kg	3 / 3	0.00047	mg/Kg	Max
	Arsenic	0.17	29.3	mg/Kg	27 / 27	15	mg/Kg	95% UCL - T
	Nickel	5.7	48950	mg/Kg	27 / 27	13941	mg/Kg	95% UCL - NP
	Uranium, total	0.78	43383	mg/Kg	71 / 71	3902	mg/Kg	95% UCL - NP
	Ra-226	0.39	1600	pCi/g	119 / 133	77	pCi/g	95% UCL - NP
	U-234	0.22	5340	pCi/g	71 / 71	557	pCi/g	95% UCL - NP
	U-235	0.03	730	pCi/g	69 / 133	40	pCi/g	95% UCL - NP
	U-238	0.25	14200	pCi/g	71 / 71	1277	pCi/g	95% UCL - NP

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); Arithmetic Mean (Mean)

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface soil - i.e., the concentrations that will be used to estimate the exposure and risk for each COC in surface soil. The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. For all exposure points, this table indicates that inorganic chemicals are the most frequently detected COCs in surface soil at the site. The 95% UCL on the arithmetic mean was used as the EPC for the inorganic compounds arsenic, nickel, and uranium, for the radionuclides Ra-226, U-234, U-235, and U-238, and for the organic chemicals benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. However, due to the limited amount of sample data available for dioxins, the maximum detected concentration was used as the default EPC.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-4

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
Combined On-Site	Nickel	101	39700	mg/Kg	12 / 12	39700	mg/Kg	Max
Adjacent Residence	Benzo(a)anthracene	0.34	180	mg/Kg	7 / 12	96	mg/Kg	95% UCL - T
	Benzo(a)pyrene	0.003	140	mg/Kg	10 / 12	140	mg/Kg	Max
	Benzo(b)fluoranthene	0.004	150	mg/Kg	10 / 12	150	mg/Kg	Max
	Dibenz(a,h)anthracene	0.19	1.6	mg/Kg	4 / 12	1.6	mg/Kg	Max
	Dioxin TEQ	0.00232	0.00232	mg/Kg	1 / 1	0.00232	mg/Kg	Max
	Arsenic	1.55	18.2	mg/Kg	11 / 12	18.2	mg/Kg	Max
	Nickel	101	39700	mg/Kg	12 / 12	39700	mg/Kg	Max
	Uranium, total	0.00000013	151	mg/Kg	40 / 40	28	mg/Kg	95% UCL - NP
	Ra-226	0.127	900	pCi/g	86 / 123	40	pCi/g	95% UCL - NP
	U-234	0.13	39.3	pCi/g	39 / 40	5.7	pCi/g	95% UCL - T
	U-235	0.02	3.37	pCi/g	30 / 123	0.58	pCi/g	95% UCL - NP
	U-238	0.05	49.4	pCi/g	39 / 40	7.8	pCi/g	95% UCL - T
On-Site Residence	Benzo(a)anthracene	0.34	180	mg/Kg	7 / 12	96	mg/Kg	95% UCL - T
	Benzo(a)pyrene	0.003	140	mg/Kg	10 / 12	140	mg/Kg	Max
	Benzo(b)fluoranthene	0.004	150	mg/Kg	10 / 12	150	mg/Kg	Max
	Benzo(k)fluoranthene	0.022	110	mg/Kg	6 / 12	49	mg/Kg	95% UCL - T
	Dibenz(a,h)anthracene	0.19	1.6	mg/Kg	4 / 12	1.6	mg/Kg	Max
	Indeno(1,2,3-cd)pyrene	0.071	110	mg/Kg	7 / 12	43	mg/Kg	95% UCL - T
	Dioxin TEQ	0.00232	0.00232	mg/Kg	1 / 1	0.00232	mg/Kg	Max
	Arsenic	1.55	18.2	mg/Kg	11 / 12	18.2	mg/Kg	Max
	Chromium	3.5	2740	mg/Kg	12 / 12	2740	mg/Kg	Max
	Mercury	0.08	41	mg/Kg	10 / 12	41	mg/Kg	Max
	Nickel	101	39700	mg/Kg	12 / 12	39700	mg/Kg	Max
	Ra-226	0.127	900	pCi/g	86 / 123	40	pCi/g	95% UCL - NP
	U-238	0.05	49.4	pCi/g	39 / 40	7.8	pCi/g	95% UCL - T

Key

(1) Statistics: Maximum Detected Value (Max), 95% UCL of Transformed Data (95% UCL - T), 95% UCL of Normal Data (95% UCL - N), 95% UCL of Non-parametric Data (95% UCL - NP), Arithmetic Mean (Mean)

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in subsurface soil (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in subsurface soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. For all exposure points, this table indicates that inorganic chemicals are the most frequently detected COCs in subsurface soil at the site. The 95% UCL on the arithmetic mean was used as the EPC for the inorganic compound uranium, for the radionuclides Ra-226, U-234, U-235, and U-238, and for the organic chemicals benzo(a)anthracene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. However, due to the limited amount of sample data available for dioxins, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, chromium, mercury, and nickel, the maximum detected concentration was used as the default EPC.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-5

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
Combined	Benzene	0.5	3.7	ug/L	5 / 25	3.7	ug/L	Max
	cis-1,2-Dichloroethene	0.71	5000	ug/L	15 / 25	5000	ug/L	Max
	Trichloroethene	0.56	9.8	ug/L	6 / 25	9.8	ug/L	Max
	Vinyl chloride	0.87	500	ug/L	8 / 25	500	ug/L	Max
	Benzo(b)fluoranthene	0.13	0.13	ug/L	1 / 3	0.13	ug/L	Max
	Arsenic	0.65	69.6	ug/L	18 / 25	69.6	ug/L	Max
	Barium	7.9	3760	ug/L	25 / 25	3760	ug/L	Max
	Beryllium	0.2	75.1	ug/L	7 / 25	75.1	ug/L	Max
	Cadmium	0.31	70.9	ug/L	9 / 25	70.9	ug/L	Max
	Chromium	0.3	203	ug/L	21 / 25	203	ug/L	Max
	Manganese	8.7	18600	ug/L	25 / 25	18600	ug/L	Max
	Nickel	1.1	15300	ug/L	25 / 25	15300	ug/L	Max
	Zinc	5.3	15800	ug/L	22 / 25	15800	ug/L	Max
	U-234	0.05	118	pCi/L	19 / 23	118	pCi/L	Max
	U-235	0.06	9.4	pCi/L	8 / 23	9.4	pCi/L	Max
	U-238	0.03	15	pCi/L	16 / 23	15	pCi/L	Max

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL of Transformed Data (95% UCL - T); 95% UCL of Normal Data (95% UCL - N); 95% UCL of Non-parametric Data (95% UCL - NP); Arithmetic Mean (Mean)

The table represents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in groundwater (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in groundwater). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that inorganic chemicals are the most frequently detected COCs in groundwater at the site. As prescribed by EPA guidance, the maximum detected concentration was used as the EPC for all COCs detected in groundwater.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

through the Site. Residences are found to the north and east of the site and also across Chartley Swamp. There are numerous residential wells within a 3-mile radius of the Site, the closest well being located at the former Shpack residence.

The risk assessment looked at several different exposure pathways consistent with current and future potential uses at the Site. The following current uses were evaluated in the risk assessment:

- Adjacent resident with exposure to groundwater through ingestion;

- Former Shpack resident (adult)/worker at adjacent landfill with exposure to surface soil through ingestion, dermal contact, and external exposure to radionuclides;

- Trespasser (adolescent) with exposure to surface soil by ingestion, dermal contact, and external exposure to radionuclides; to surface water (by dermal contact) and to sediment (by ingestion and dermal contact) within the wetland areas of the Site.

These current exposure pathways and receptors identified may continue in the future.

The following future uses were also evaluated in the risk assessment:

- Adjacent resident with exposure to groundwater through ingestion;

- Adjacent resident (adult and child)/worker to the site with exposure to surface and subsurface soil through ingestion, dermal contact, and external exposure to radionuclides;

- Former Shpack resident (adult and child) with exposure to surface and subsurface soil through ingestion, dermal contact, inhalation, and external exposure to radionuclides;

- On-site resident (adult and child) with exposure to surface and subsurface soil through ingestion, dermal contact, external exposure to radionuclides, inhalation of volatile contaminants present in soil and groundwater following migration to indoor air; and to groundwater through ingestion;

- Recreational (adult and child) with exposure to surface and subsurface soil through ingestion, dermal contact, external exposure to radionuclides; to surface water (by dermal contact) and to sediment (by ingestion and dermal contact); and,

- Construction and utility workers with direct exposure to surface and subsurface soil contaminants, direct exposure to shallow exposed groundwater and inhalation of volatile contaminants in soil and groundwater following migration to outdoor air.

In the future, removal of the fencing after completion of the remedial action could allow an increased intensity and frequency of exposure to on-site soil contaminants for the adjacent resident and for trespassers.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be

greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1 x 10^{-6} or 1E-06 for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined) to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" - or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposure is 10^{-4} to 10^{-6}. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table G-6.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake level by the reference dose (RfD) or other suitable benchmark. Reference doses have been developed by EPA and they represent a level to which an individual may be exposed that is not expected to result in any deleterious effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. A HQ < 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) within or across those media to which the same individual may reasonably be exposed. A HI < 1 indicates that toxic non-carcinogenic effects are unlikely. A summary of the non-carcinogenic toxicity data relevant to the chemicals of concern is presented in Table G-7.

The following is a brief summary of the exposure pathways that were found to present significant risks exceeding EPA's cancer risk range and noncancer threshold. A more thorough description of all exposure pathways evaluated in the risk assessment, including estimates for an average exposure scenario, can be found in Section 5 and on Tables 9.1 through 9.22 of the risk assessment (M&E, 2004). [2]

[2]For contaminated groundwater, ingestion of 2 liters/day, 350 days/year for 24 years was presumed for an adult. For a young child (age 1 to 6), ingestion of 1.5 liters/day, 350 days/year for 6 years was presumed. Dermal contact and incidental ingestion of soils was evaluated for a young child and adult recreational user and on-site resident who may be exposed 78 or 150 days/year, respectively, for a total of 30 years. Dermal contact and incidental ingestion of soils was also evaluated for a young child and adult adjacent resident, assumed to be equally exposed to soil contaminants in both the yard of the former Shpack residence and the site interior (75 days/year at each location). Soil ingestion rates for the young child and adult were presumed to be 200 mg/day and 100 mg/day, respectively. Dermal contact with surface water along with incidental ingestion and dermal contact with sediment was evaluated to reflect a young child and adult recreational user who may wade in the wetlands 78 days each summer for a total of 30 years. Sediment ingestion rates were the same as those presumed for soils. Incidental ingestion of and dermal contact with subsurface soils were evaluated for the construction worker who was presumed to be exposed 125 days/year. The soil ingestion rate for the worker was presumed to be 200 mg/day

Table G-6

Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Benzene	5.5E-02	5.5E-02	(mg/kg-day)$^{-1}$	A	IRIS	07/01/03
cis-1,2-Dichloroethene	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Trichloroethene	4.0E-01	4.0E-01	(mg/kg-day)$^{-1}$	C-B2	NCEA	07/01/03
Vinyl chloride	1.5E+00	1.5E+00	(mg/kg-day)$^{-1}$	C	IRIS	07/01/03
Benzo(a)anthracene	7.3E-01	7.3E-01	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Benzo(a)pyrene	7.3E+00	7.3E+00	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Benzo(b)fluoranthene	7.3E-01	7.3E-01	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Benzo(k)fluoranthene	7.3E-02	7.3E-02	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Dibenz(a,h)anthracene	7.3E+00	7.3E+00	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Indeno(1,2,3-cd)pyrene	7.3E-01	7.3E-01	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Aroclor 1254	2.0E+00	2.0E+00	(mg/kg-day)$^{-1}$	B2	IRIS	07/01/03
Dioxin TEQ	1.5E+05	1.5E+05	(mg/kg-day)	B2	HEAST	07/01/97
Arsenic	1.5E+00	1.5E+00	(mg/kg-day)$^{-1}$	A	IRIS	07/01/03
Barium	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Beryllium	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Cadmium	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Chromium	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Manganese	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Mercury	N/A	N/A	(mg/kg-day)$^{-1}$	C	IRIS	07/01/03
Nickel	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Zinc	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03
Uranium, total	N/A	N/A	(mg/kg-day)$^{-1}$	D	IRIS	07/01/03

Pathway: External (Radiation)

Chemical of Concern	Cancer Slope or Conversion Factor	Exposure Route	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Ra-226	8.49E-06	External Exposure	Risk/year per pCi/g soil	A	HEAST	07/01/03
U-234	2.52E-10	External Exposure	Risk/year per pCi/g soil	A	HEAST	07/01/03
U-235	5.43E-07	External Exposure	Risk/year per pCi/g soil	A	HEAST	07/01/03
U-238	1.14E-07	External Exposure	Risk/year per pCi/g soil	A	HEAST	07/01/03
Ra-226	7.3E-10	Soil Ingestion	Risk/pCi soil	A	HEAST	07/01/03
U-234	1.6E-10	Soil Ingestion	Risk/pCi soil	A	HEAST	07/01/03
U-235	1.6E-10	Soil Ingestion	Risk/pCi soil	A	HEAST	07/01/03
U-238	2.1E-10	Soil Ingestion	Risk/pCi soil	A	HEAST	07/01/03
U-234	7.1E-11	Water Ingestion	Risk/pCi water	A	HEAST	07/01/03
U-235	7.2E-11	Water Ingestion	Risk/pCi water	A	HEAST	07/01/03
U-238	8.7E-11	Water Ingestion	Risk/pCi water	A	HEAST	07/01/03

Key

N/A Not applicable

IRIS Integrated Risk Information System, U.S. EPA

NCEA National Center for Environmental Assessment, U.S. EPA

HEAST Health Effects Assessment Summary Tables, U.S. EPA

EPA Group

A Human carcinogen

B1 Probable human carcinogen - Indicates that limited human data are available

B2 - Probable human carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans

C Possible human carcinogen

D Not classifiable as a human carcinogen

E Evidence of noncarcinogenicity

The table provides the carcinogenic risk information which is relevant to the contaminants of concern in surface water, sediment, soil, and groundwater. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in this assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, adjustment is not necessary for the chemicals evaluated at this site. Therefore, the same values presented above were used as the dermal carcinogenic slope factors for these contaminants.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-7

Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of Rfd: Target Organ (MM/DD/YYYY)
Benzene	Chronic	4.0E-03	mg/kg-day	4.0E-03	mg/kg-day	Immune System	300	IRIS	07/01/03
cis-1,2-Dichloroethene	Chronic	1.0E-02	mg/kg-day	1.0E-02	mg/kg-day	Blood	3000	HEAST	07/01/97
Trichloroethene	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Liver	3000	NCEA	07/01/03
Vinyl chloride	Chronic	3.0E-03	mg/kg-day	3.0E-03	mg/kg-day	Liver	30	IRIS	07/01/03
Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1254	Chronic	2.0E-05	mg/kg-day	2.0E-05	mg/kg-day	Immune System	300	IRIS	07/01/03
Dioxin TEQ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Skin	3	IRIS	07/01/03
Barium	Chronic	7.0E-02	mg/kg-day	4.9E-03	mg/kg-day	Cardiovascular	3	IRIS	07/01/03
Beryllium	Chronic	2.0E-03	mg/kg-day	1.4E-05	mg/kg-day	GI System	300	IRIS	07/01/03
Cadmium	Chronic	5.0E-04	mg/kg-day	1.3E-05	mg/kg-day	Kidney	10	IRIS	07/01/03
Chromium	Chronic	3.0E-03	mg/kg-day	7.5E-05	mg/kg-day	GI System	300	IRIS	07/01/03
Manganese	Chronic	2.4E-02	mg/kg-day	9.6E-04	mg/kg-day	Nervous System	1	IRIS	07/01/03
Mercury	Chronic	1.0E-04	mg/kg-day	1.0E-04	mg/kg-day	Nervous System	10	IRIS	07/01/03
Nickel	Chronic	2.0E-02	mg/kg-day	8.0E-04	mg/kg-day	General Toxicity	300	IRIS	07/01/03
Zinc	Chronic	3.0E-01	mg/kg-day	3.0E-01	mg/kg-day	Blood	3	IRIS	07/01/03
Uranium, total	Chronic	3.0E-03	mg/kg-day	1.5E-04	mg/kg-day	Kidney	1000	IRIS	07/01/03
Nickel	Subchronic	2.0E-02	mg/kg-day	8.0E-04	mg/kg-day	General Toxicity	300	IRIS	07/01/03

Key

N/A - No information available

IRIS - Integrated Risk Information System, U.S. EPA

NCEA - National Center for Environmental Assessment, U.S. EPA

HEAST - Health Effects Assessment Summary Tables, U.S. EPA

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in surface water, sediment, soil, and groundwater. Fifteen of the COCs have toxicity data indicating their potential for adverse non-carcinogenic health effects in humans. Chronic and subchronic toxicity data available for the fifteen COCs for oral exposures have been used to develop chronic and subchronic oral reference doses (RfDs), provided in this table. The available chronic and subchronic toxicity data indicate that trichloroethene and vinyl chloride affect the liver, benzene and Aroclor-1254 affect the immune system, cis-1,2-dichloroethene and zinc affect the blood, arsenic affects the skin, barium affects the cardiovascular system, cadmium and uranium affect the kidneys, beryllium and chromium affect the gastrointestinal system, manganese and mercury affect the nervous system, and nickel causes general toxicity resulting in growth reduction. Reference doses are not available for the carcinogenic polycyclic aromatic hydrocarbons (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene) or dioxin. Dermal RfDs are not available for any of the COCs. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate. Dermal RfDs have been extrapolated for the inorganic compounds barium, beryllium, cadmium, chromium, manganese, nickel, and uranium that have less than 50% absorption via the ingestion route.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Recreational Use

Tables G-8 and G-12 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface water and surface soil evaluated to reflect potential future recreational exposure corresponding to the reasonable maximum exposure (RME) scenario. For the future young child and adult recreational user, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and a target organ HI of 1. The exceedences were due primarily to the presence of benzo(a)pyrene, beryllium, chromium, and nickel in surface water, Aroclor-1254 in sediment, and nickel, uranium, Ra-226, and U-238 in surface soil.

On-Site Resident

Tables G-9 and G-13 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect potential future RME residential drinking water exposure. Carcinogenic and non-carcinogenic risks for the future resident drinking water ingestion scenario exceeded the EPA acceptable risk range primarily due to the presence of the following compounds in groundwater: cis-1,2-dichloroethene, trichloroethene, vinyl chloride, arsenic, barium, beryllium, cadmium, chromium, manganese, nickel, zinc, and U-234. In addition, the following compounds detected in groundwater exceeded MCLs: cis-1,2-dichloroethene, trichloroethene, vinyl chloride, arsenic, barium, beryllium, cadmium, chromium, lead, and uranium.

Tables G-10 and G-14 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface and subsurface soil evaluated to reflect potential future on-site residential exposures for the RME scenario. For the future on-site resident, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range for surface and subsurface soil due primarily to the presence of nickel, uranium, Ra-226, U-235, and U-238 in surface soil and chromium, mercury, nickel, benzo(a)pyrene, benzo(b)fluoranthene, dioxin, and Ra-226 in subsurface soil.

Adjacent Resident

Tables G-11 and G-15 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface and subsurface soil evaluated to reflect potential future adjacent residential exposures for the RME scenario. For the future adjacent resident, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range for surface and subsurface soil due primarily to the presence of nickel, uranium, Ra-226, and U-238 in surface and subsurface soils.

Tables G-9 and G-13 depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect potential future RME residential drinking water exposure. Carcinogenic and non-carcinogenic risks for the future resident drinking water ingestion scenario exceeded the EPA acceptable risk range primarily due to the presence of the following compounds in groundwater: cis-1,2-dichloroethene, trichloroethene,

Table G-8

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Water	Surface Water	Site-wide	Benzo(a)pyrene	--	--	1E-04	--	1E-04
			Benzo(b)fluoranthene	--	--	1E-05	--	1E-05
			Benzo(k)fluoranthene	--	--	4E-06	--	4E-06
			Aroclor-1254	--	--	1E-05	--	1E-05
							Surface Water Risk Total =	2E-04
Soil	Surface Soil	Combined On-Site	Benzo(a)anthracene	3E-06	--	1E-06	--	5E-06
			Benzo(a)pyrene	2E-05	--	7E-06	--	2E-05
			Benzo(b)fluoranthene	1E-06	--	5E-07	--	2E-06
			Dibenz(a,h)anthracene	3E-06	--	1E-06	--	4E-06
			Dioxin TEQ	2E-05	--	2E-06	--	3E-05
			Arsenic	8E-06	--	7E-07	--	9E-06
			Ra-226	2E-05	--	--	1E-04	1E-04
			U-234	2E-05	--	--	3E-08	2E-05
			U-235	2E-06	--	--	4E-06	6E-06
			U-238	8E-05	--	--	3E-05	1E-04
							Surface Soil Risk Total =	3E-04
							Total Risk =	5E-04

Key

-- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult's exposure to surface water and surface soil, as well as the toxicity of the COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, dioxin, Aroclor-1254, arsenic, Ra-226, U-234, U-235, and U-238). The total risk from direct exposure to contaminated surface water and surface soil at this site to a future young child/adult recreational user is estimated to be 5×10^{-4}. The COCs contributing most to this risk level are benzo(a)pyrene in surface water and Ra-226 and U-238 in surface soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 5 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-9

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Groundwater	Combined	Benzene	4E-06	--	--	--	4E-06
			Trichloroethene	7E-05	--	--	--	7E-05
			Vinyl chloride	1E-02	--	--	--	1E-02
			Benzo(b)fluoranthene	2E-06	--	--	--	2E-06
			Arsenic	2E-03	--	--	--	2E-03
			U-234	2E-04	--	--	--	2E-04
			U-235	1E-05	--	--	--	1E-05
			U-238	3E-05	--	--	--	3E-05
							Groundwater Risk Total =	2E-02
							Total Risk =	2E-02

Key

-- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult's exposure to groundwater, as well as the toxicity of the COCs (benzene, trichloroethene, vinyl choride, benzo(b)fluoranthene, arsenic, U-234, U-235, and U-238). The total risk from direct exposure to contaminated groundwter at this site to a future young child/adult resident is estimated to be 2×10^{-2}. The COCs contributing most to this risk level are vinyl chloride, arsenic, and U-234 in groundwater. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 2 in 100 of developing cancer as a result of site-related exposure to the COCs

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-10

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: On-Site Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	On-Site Residence	Benzo(a)anthracene	7E-06	--	3E-06	--	9E-06
			Benzo(a)pyrene	3E-05	--	1E-05	--	5E-05
			Benzo(b)fluoranthene	2E-06	--	9E-07	--	3E-06
			Dibenz(a,h)anthracene	6E-06	--	2E-06	-	8E-06
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	-	2E-06
			Dioxin TEQ	5E-06	--	4E-06	-	5E-05
			Arsenic	1E-06	--	1E-06	-	2E-05
			Ra-226	3E-05	--	--	3E-03	3E-03
			U-234	5E-05	--	--	6E-07	5E-05
			U-235	3E-06	--	--	9E-05	1E-04
			U-238	1E-04	--	--	6E-04	8E-04
							Surface Soil Risk Total =	4E-03
Soil	Subsurface Soil	On-Site Residence	Benzo(a)anthracene	5E-05	--	2E-05	--	7E-05
			Benzo(a)pyrene	7E-04	--	3E-04	--	1E-03
			Benzo(b)fluoranthene	7E-05	--	3E-05	--	1E-04
			Benzo(k)fluoranthene	2E-06	--	1E-06	--	3E-06
			Dibenz(a,h)anthracene	8E-06	--	3E-06	--	1E-05
			Indeno(1,2,3-cd)pyrene	2E-05	--	9E-06	--	3E-05
			Dioxin TEQ	2E-04	--	2E-05	--	3E-04
			Arsenic	2E-05	-	2E-06	--	2E-05
			Ra-226	2E-05	-		1E-03	1E-03
			U-238	9E-07	--	--	4E-06	5E-06
							Subsurface Soil Risk Total =	3E-03
							Total Risk =	7E-03

Key

-- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult's exposure to surface and subsurface soil, as well as the toxicity of the COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, dioxin, arsenic, Ra-226, U-234, U-235 and U-238). The total risk from direct exposure to contaminated surface and subsurface soil at this site to a future young child/adult on-site resident is estimated to be 7×10^{-3}. The COCs contributing most to this risk level are Ra-226, U-235, and U-238 in surface soil and benzo(a)pyrene, benzo(b)fluoranthene, dioxin and Ra-226 in subsurface soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 7 in 1,000 of developing cancer as a result of site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-11

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Adjacent Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	Adjacent Residence	Benzo(a)anthracene	3E-06	- -	1E-06	- -	5E-06
			Benzo(a)pyrene	2E-05	- -	7E-06	- -	2E-05
			Benzo(b)fluoranthene	1E-06	- -	5E-07	- -	2E-06
			Dibenz(a,h)anthracene	3E-06	- -	1E-06	- -	4E-06
			Dioxin TEQ	2E-05	- -	2E-06	- -	3E-05
			Arsenic	1E-05	- -	1E-06	- -	1E-05
			Ra-226	2E-06	- -	- -	1E-04	2E-04
			U-234	2E-05	- -	- -	3E-06	2E-05
			U-235	2E-06	- -	- -	4E-06	6E-06
			U-238	8E-05	- -	- -	3E-05	1E-04
							Surface Soil Risk Total =	4E-04
Soil	Subsurface Soil	Adjacent Residence	Benzo(a)anthracene	3E-06	- -	1E-06	- -	5E-06
			Benzo(a)pyrene	2E-05	- -	7E-06	- -	2E-05
			Benzo(b)fluoranthene	1E-06	- -	5E-07	- -	2E-06
			Dibenz(a,h)anthracene	3E-06	- -	1E-06	- -	4E-06
			Dioxin TEQ	2E-05	- -	2E-06	- -	3E-05
			Arsenic	9E-06	- -	9E-07	- -	1E-05
			Ra-226	2E-05	- -	- -	1E-04	1E-04
			U-234	2E-05	- -	- -	3E-06	2E-05
			U-235	2E-06	- -	- -	4E-06	6E-06
			U-238	8E-05	- -	- -	3E-05	1E-04
							Subsurface Soil Risk Total =	3E-04
							Total Risk =	7E-04

Key

- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult's exposure to surface and subsurface soil, as well as the toxicity of the COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, dioxin, arsenic, Ra-226, U-234, U-235, and U-238). The total risk from direct exposure to contaminated surface and subsurface soil at this site to a future young child/adult adjacent resident is estimated to be 7×10^{-4}. The COCs contributing most to this risk level are Ra-226 and U-238 in surface and subsurface soil. This risk level indicates that if no clean up action is taken, an individual would have an increased probability of 7 in 10,000 of developing cancer as a result of site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-12

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Site-wide	Beryllium	GI System	--	--	3E+00	3E+00
			Chromium	GI System	--	--	9E+00	9E+00
			Nickel	General Toxicity	--	--	2E+00	2E+00
							Surface Water Hazard Index Total =	1E+01
Sediment	Sediment	Site-wide	Aroclor-1254	Immune System	3E+00	--	1E+00	4E+00
							Sediment Hazard Index Total =	4E+00
Soil	Surface Soil	Combined On-Site	Nickel	General Toxicity	2E+00	--	N/A	2E+00
			Uranium, total	Kidney	4E+00	--	N/A	4E+00
							Soil Hazard Index Total =	6E+00
							Receptor Hazard Index =	2E+01
							General Toxicity Hazard Index =	4E+00
							GI System Hazard Index =	1E+01
							Immune System Hazard Index =	4E+00
							Kidney Hazard Index =	4E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure

-- Route of exposure is not applicable to this medium

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 4 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface water containing beryllium, chromium, and nickel, sediment containing Aroclor-1254, and surface soil containing nickel and uranium.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-13

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Combined	cis-1,2-Dichloroethene	Blood	5E+01	--	--	5E+01
			Trichloroethene	Liver	3E+00	--	--	3E+00
			Vinyl chloride	Liver	2E+01	--	--	2E+01
			Arsenic	Skin	2E+01	--	--	2E+01
			Barium	Cardiovascular	5E+00	--	--	5E+00
			Beryllium	GI System	4E+00	--	--	4E+00
			Cadmium	Kidney	1E+01	--	--	1E+01
			Chromium	GI System	6E+00	--	--	6E+00
			Manganese	Nervous System	7E+01	--	--	7E+01
			Nickel	General Toxicity	7E+01	--	--	7E+01
			Zinc	Blood	5E+00	--	--	5E+00
							Groundwater Hazard Index Total =	3E+02
							Receptor Hazard Index =	3E+02
							Blood Hazard Index =	5E+01
							Cardiovascular Hazard Index =	5E+00
							General Toxicity Hazard Index =	7E+01
							GI System Hazard Index =	1E+01
							Kidney Hazard Index =	1E+01
							Liver Hazard Index =	2E+01
							Nervous System Hazard Index =	7E+01
							Skin Hazard Index =	2E+01

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 300 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated groundwater containing cis-1,2-dichloroethene, trichloroethene, vinyl chloride, arsenic, barium, beryllium, cadmium, chromium, manganese, nickel, and zinc.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-14

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: On-Site Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	On-Site Residence	Nickel	General Toxicity	4E+00	- -	N/A	4E+00
			Uranium, total	Kidney	7E+00	- -	N/A	7E+00
							Surface Soil Hazard Index Total =	1E+01
Soil	Subsurface Soil	On-Site Residence	Chromium	GI System	5E+00	- -	N/A	5E+00
			Mercury	Nervous System	2E+00	- -	N/A	2E+00
			Nickel	General Toxicity	1E+01	- -	N/A	1E+01
							Subsurface Soil Hazard Index Total =	2E+01
							Receptor Hazard Index =	3E+01
							General Toxicity Hazard Index =	1E+01
							GI System Hazard Index =	5E+00
							Nervous System Hazard Index =	2E+00
							Kidney Hazard Index =	7E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 30 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface soil containing nickel and uranium and subsurface soil containing chromium, mercury, and nickel

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-15

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Adjacent Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Adjacent Residence	Nickel	General Toxicity	2E+00	--	N/A	2E+00
			Uranium, total	Kidney	4E+00	--	N/A	4E+00
							Surface Soil Hazard Index Total =	6E+00
Soil	Subsurface Soil	Adjacent Residence	Nickel	General Toxicity	2E+00	--	N/A	2E+00
			Uranium, total	Kidney	4E+00	--	N/A	4E+00
							Subsurface Soil Hazard Index Total =	6E+00
							Receptor Hazard Index =	1E+01
							General Toxicity Hazard Index =	4E+00
							Kidney Hazard Index =	7E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 10 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated surface and subsurface soil containing nickel and uranium.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

vinyl chloride, arsenic, barium, beryllium, cadmium, chromium, manganese, nickel, zinc, and U-234. In addition, the following compounds detected in groundwater exceeded MCLs: cis-1,2-dichloroethene, trichloroethene, vinyl chloride, arsenic, barium, beryllium, cadmium, chromium, lead, and uranium.

Construction Worker

Table G-16 depicts the non-carcinogenic risk summary for the chemicals of concern in subsurface soil evaluated to reflect potential future construction worker exposure for the RME scenario. For the construction worker, the non-carcinogenic risk exceeds the EPA acceptable risk range for subsurface soil exposure due to the presence of nickel.

This ROD is based upon the adjacent resident without groundwater consumption exposure scenario. Readers are referred to Section 5 and Tables 9.1 through 9.22 of the risk assessment (M&E, 2004) for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern and for estimates of the central tendency risk.

Risks Associated with Exposure to Lead

The Integrated Exposure and Uptake Biokinetic (IEUBK) model was used to evaluate the hazard potential posed by exposure of future on-site young child residents as the most sensitive receptor group. The average time-weighted soil lead concentration was used as the soil concentration in the model. Default values, as recommended in the model, were used for all other inputs. The outcome of the model revealed that 5.6% of an exposed population is predicted to have blood lead levels greater than 10 µg/dl. It is EPA policy to protect 95% of the sensitive population against blood lead levels in excess of 10 µg/dl blood. The adult lead model was used to evaluate the hazard potential posed by exposure of the developing fetus as the most sensitive receptor group. A geometric standard deviation in intake and biokinetics of 1.8 was used in the model which is typical of populations in small areas dominated by a single source of lead. A typical blood lead concentration in the absence of site exposures was assumed to be 2.0 µg/dL, which is a mid-range default assumption. The outcome of the model revealed that 15.4% of an exposed population is predicted to have blood lead levels greater than 10 µg/dl. It is EPA policy to protect 95% of the sensitive population against blood lead levels in excess of 10 µg/dl blood. This means that exposures to lead in on-site soil were estimated to result in an exceedance of the blood lead level goal for a future construction worker and a future on-site adult and young child resident.

Uncertainties

Estimation of risks to human health that may result from exposure to chemicals and radionuclides at the Site is a complex process. Each assumption, whether regarding the toxicity value to use for a particular COPC or the value of a parameter in an exposure equation, has a degree of variability and uncertainty associated with it. In each step of the risk assessment process, beginning with the data collection and analysis and continuing through the toxicity assessment, exposure assessment, and risk characterization, conservative assumptions are made that are intended to be protective of human health and to ensure that risks are not underestimated. The following provides a discussion of the key uncertainties that may affect the final estimates of human health risk at this Site. One assumption in the risk assessment was that the concentrations of chemicals would remain constant over time. Because of this assumption, historical and recently collected sampling data were combined allowing for the use of a more robust data set.

Table G-16

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil	Combined On-Site	Nickel	General Toxicity	2E+00	--	N/A	2E+00
							Subsurface Soil Hazard Index Total =	2E+00
							Receptor Hazard Index =	2E+00
							General Toxicity Hazard Index =	2E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund state's that, generally, a hazard index (HI) of greater than 1 indictes the potential for adverse noncancer effects. The estimated HI of 2 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated subsurface soil containing nickel.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

This assumption may overestimate risks, depending on the degree of chemical degradation or transport to other media. Conversely, biodegradation of chemicals to more toxic chemicals was also not considered. However, the natural decay of radionuclides to short-lived decay products was factored into the risk estimates through the use of toxicity values that include these decay products. COCs currently undergoing re-evaluation for carcinogenic potency include dioxin and trichloroethene. An interim revised cancer slope factor for dioxin indicates that the cancer risk associated with dioxin exposure may be as much as 6.2 times greater than the risks estimated in this risk assessment. Estimates of carcinogenic potency for trichloroethene range over nearly two orders of magnitude. The high-end of the range of oral slope factors and unit risk values was used for carcinogenic risk estimation. Therefore, carcinogenic risks for trichloroethene may have been overestimated.

The bioavailability of COPCs by the oral exposure route through the ingestion of soil and sediment is uncertain. The animal bioassays on which the toxicity values are based do not involve feeding of chemicals in a soil/sediment matrix. Oral absorption of chemicals from soil/sediment may be diminished due to the matrix effect, particularly for inorganics that may be a component of the mineral structure of these media and, thus, not available for uptake. This may have resulted in an overestimation of inorganic risks.

For dermal exposure pathways, the absence of dermal toxicity criteria necessitated the use of oral toxicity data. To calculate risk estimates for the dermal pathway, absolute oral bioavailability factors that reflect the toxicity study conditions were used to modify the oral toxicity criteria. For the chemicals with oral absorption exceeding 50% (e.g., the PAHs), a default oral absorption factor of 100% was used. The risk estimates for the dermal pathways may be over- or underestimated depending on how closely these values reflect the difference between the oral and dermal routes.

Reasonable Maximum Exposure (RME) risks are conservative since estimated risks are based on upper-bound exposure assumptions. Actual risks for some individuals within an exposed population may vary from those predicted depending upon their actual intake rates (e.g., soil ingestion rates) or body weights. Therefore, exposures and estimated risks are likely to be overestimated.

In a limited number of cases, a small number of environmental samples were collected resulting in the use of the maximum detected level of a COPC as the RME EPC. Use of the maximum detected result instead of the 95% UCL value for the RME EPC results in an overestimate of risk.

For groundwater, maximum detected COPC concentrations were used as the RME EPCs, as prescribed by EPA guidance. This assumption is protective of worst-case groundwater exposures that may occur during future pumping events. Because the maximum detected groundwater concentrations are not co-located at this site, it is unlikely that the installation of a well would result in exposure to maximum detected concentrations of each groundwater COPC. Therefore, this approach likely results in an overestimate of risk.

2. Ecological Risk Assessment

An ecological risk assessment (ERA) was completed for the Shpack Landfill Superfund Site to evaluate the likelihood and magnitude of potential ecological effects associated with historical disposal practices. The ERA evaluated the potential for contaminants in soil, surface water, and sediment to impact ecological receptor populations within six distinct exposure areas: the Tongue Area, combined field and shrubland, onsite seasonal wetlands, hardwood forest, Chartley Swamp, and Chartley Pond. See Figure 4.

In accordance with EPA policy, a screening level ecological risk assessment (SLERA) can be sufficient to document risk in areas where a known remedy will be implemented when risk is driven by other factors, such as another risk assessment. Based on the feasibility study, which incorporates the human health risk assessment for the Shpack site, it was determined that remediation at the Tongue Area and the combined field and shrubland would require some action to take place, such as capping under the original proposed plan. As a result, additional evaluation of ecological risk within these two exposure areas was not thought to be necessary since risk associated with potential exposure to ecological receptors was to have been eliminated. Therefore, evaluations associated with the Tongue Area and the combined field and shrubland were not included in the BERA.

Because the selected remedy does not in fact cap the Combined Field and Shrubland habitat, an assessment of ecological risk posed by soil in the Combined Field and Shrubland habitat (Figure 4) of the site will be performed utilizing food chain models developed to evaluate receptor risk from soil in other areas of the site following 1997 EPA Superfund ecological risk assessment guidance. This evaluation will be limited to those areas which are not being excavated due to human health risk.

Evaluations associated with Chartley Pond are not included in the ROD because no risk was identified in Chartley Pond in the SLERA. Because radiation standards for human populations will also protect populations of non-human biota, risk from radiological effects were covered by the human health risk assessment and were not evaluated in the ERA.

Identification of Chemicals of Concern

Contaminants of concern (COCs) were identified using an effects-based screening involving the comparison of maximum contaminant concentrations to ecological benchmarks for each medium and within each exposure area. Data used to identify COCs are summarized below in Table G-17 (hardwood forest), Table G-18 and Table G-19 (Chartley Swamp), and Table G-20 and Table G-21 (onsite seasonal wetlands).

Exposure Assessment

The hardwood forest provides habitat for a variety of terrestrial receptors, including small mammals and terrestrial songbirds. Chartley Swamp provides habitat for aquatic and semi-aquatic mammals, waterfowl, bottom dwelling fish, and benthic invertebrates. When inundated, the onsite seasonal wetlands provide habitat for wetland songbirds and benthic invertebrates, and when dry provide habitat for small terrestrial mammals. The onsite seasonal wetlands also provide habitat for the spotted turtle (*Clemmys guttata*), a species of special concern in Massachusetts.

Terrestrial receptors may accumulate COCs through consumption of contaminated prey and incidental soil ingestion. Aquatic and semi-aquatic receptors may be exposed to COCs through ingestion of contaminated prey, sediment, and surface water. Exposure pathways, assessment

TABLE G-17
SOIL COPC SCREENING
FOREST
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Soil Concentration mg/kg	Ecological Soil Screening Level mg/kg	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
VOCs (mg/kg)							
1,1-Dichloroethene	0 / 10	< 0.016	23.5	Mammal	No	Below benchmark	0.0
1,2-Dichloroethene (total)	1 / 6	< 0.016	No SL	NA	Yes	No SL	NA
2-Butanone	0 / 10	< 0.016	6.487	Mammal	No	Below benchmark	0.0
Acetone	1 / 10	0.0225	36.6	Mammal	No	Below benchmark	0.0
Carbon Disulfide	0 / 10	< 0.016	No SL	NA	Yes	No SL	NA
cis-1,2-Dichloroethene	0 / 4	< 0.008	No SL	NA	Yes	No SL	NA
Methyl Acetate	0 / 4	< 0.008	No SL	NA	Yes	No SL	NA
Tetrachloroethene	0 / 10	< 0.016	2.27	Mammal	No	Below benchmark	0.0
Toluene	0 / 10	< 0.016	51.5	Mammal	No	Below benchmark	0.0
trans-1,2-Dichloroethene	0 / 4	< 0.008	No SL	NA	Yes	No SL	NA
Trichloroethene	0 / 10	< 0.016	1.387	Mammal	No	Below benchmark	0.0
Trichlorofluoromethane	0 / 4	< 0.008	No SL	NA	Yes	No SL	NA
Vinyl Chloride	0 / 10	< 0.016	0.0623	Mammal	No	Below benchmark	0.3
SVOCs (mg/kg)							
1,1'-Biphenyl	0 / 4	< 0.37	60	Phyto	No	Below benchmark	0.0
2-Methylnaphthalene	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
4-Methylphenol	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Acenaphthene	0 / 10	< 0.52	20	Phyto	No	Below benchmark	0.0
Acenaphthylene	1 / 10	0.006	No SL	NA	Yes	No SL	NA
Anthracene	1 / 10	0.004	No SL	NA	Yes	No SL	NA
Benzaldehyde	1 / 4	0.048	No SL	NA	Yes	No SL	NA
Benzo(a)anthracene	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Benzo(a)pyrene	1 / 10	0.009	1.98	Mammal	No	Below benchmark	0.0
Benzo(b)fluoranthene	3 / 10	0.041	No SL	NA	Yes	No SL	NA
Benzo(g,h,i)perylene	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Benzo(k)fluoranthene	2 / 10	0.037	No SL	NA	Yes	No SL	NA
bis(2-Ethylhexyl)phthalate	2 / 10	0.11	0.91	Avian	No	Below benchmark	0.1
Carbazole	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Chrysene	3 / 10	0.047	No SL	NA	Yes	No SL	NA
Dibenz(a,h)anthracene	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Dibenzofuran	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Diethylphthalate	0 / 10	< 0.52	100	Phyto	No	Below benchmark	0.0
Di-n-butylphthalate	0 / 10	< 0.52	0.09	Avian	Yes	Exceeds benchmark[a]	5.8
Di-n-octylphthalate	1 / 10	0.041	No SL	NA	Yes	No SL	NA
Fluoranthene	5 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Fluorene	0 / 10	< 0.52	30	Earthworm	No	Below benchmark	0.0
Indeno(1,2,3-cd)pyrene	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Naphthalene	0 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Phenanthrene	4 / 10	< 0.52	No SL	NA	Yes	No SL	NA
Phenol	0 / 10	< 0.52	30	Earthworm	No	Below benchmark	0.0
Pyrene	5 / 10	< 0.52	No SL	NA	Yes	No SL	NA
PCBs/Pesticides (mg/kg)							
4,4'-DDD	0 / 10	< 0.0057	0.002	Avian	Yes	Bioaccumulates[a]	2.9
4,4'-DDE	4 / 10	0.003	0.002	Avian	Yes	Bioaccumulates	1.5
4,4'-DDT	3 / 10	0.0054	0.002	Avian	Yes	Bioaccumulates	2.7
Aldrin	0 / 10	< 0.0029	0.733	Mammal	Yes	Bioaccumulates	0.0
alpha-BHC	0 / 10	< 0.0029	No SL	NA	Yes	Bioaccumulates	NA
alpha-Chlordane	0 / 10	< 0.0029	1.8	Avian	Yes	Bioaccumulates	0.0
Aroclor-1248	1 / 10	0.064	0.071	Mammal	Yes	Bioaccumulates	0.9
Aroclor-1254	0 / 10	< 0.057	0.111	Mammal	Yes	Bioaccumulates	0.5
Aroclor-1260	3 / 10	0.046	40	Phyto	Yes	Bioaccumulates	0.0
Dieldrin	1 / 10	0.00079	0.064	Avian	Yes	Bioaccumulates	0.0
Endosulfan I	0 / 10	< 0.0029	0.55	Mammal	Yes	Bioaccumulates	0.0
Endosulfan sulfate	1 / 10	0.0017	0.55	Mammal	Yes	Bioaccumulates	0.0
Endrin	0 / 10	< 0.0057	0.008	Avian	Yes	Bioaccumulates	0.7
Endrin aldehyde	0 / 10	< 0.0057	No SL	NA	Yes	Bioaccumulates	NA
Endrin ketone	0 / 10	< 0.0057	No SL	NA	Yes	Bioaccumulates	NA
gamma-Chlordane	0 / 10	< 0.0029	No SL	NA	Yes	Bioaccumulates	NA
Heptachlor epoxide	0 / 10	< 0.0029	No SL	NA	Yes	Bioaccumulates	NA
Methoxychlor	0 / 10	< 0.029	14.7	Mammal	Yes	Bioaccumulates	0.0

TABLE G-17
SOIL COPC SCREENING
FOREST
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Soil Concentration mg/kg	Ecological Soil Screening Level mg/kg	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
Metals (mg/kg)							
Aluminum	11 / 11	22300	3.825	Mammal	Yes	Exceeds benchmark	5830.1
Antimony	0 / 11	< 4.9	0.248	Mammal	Yes	Exceeds benchmark[a]	19.8
Arsenic	11 / 11	10.2	0.25	Mammal	Yes	Exceeds benchmark	40.8
Barium	11 / 11	356	17.2	Avian	Yes	Exceeds benchmark	20.7
Beryllium	10 / 11	0.48	2.42	Mammal	No	Below benchmark	0.2
Cadmium	4 / 11	0.35	1.2	Avian	No	Below benchmark	0.3
Calcium	11 / 11	2220	NA	Nutrient	No	Nutrient	NA
Chromium	11 / 11	17	0.4	Earthworm	Yes	Exceeds benchmark	42.5
Cobalt	6 / 11	6	20	Phyto	No	Below benchmark	0.3
Copper	9 / 11	26.9	38.9	Avian	No	Below benchmark	0.7
Cyanide	0 / 11	< 5.4	236.5	Mammal	No	Below benchmark	0.0
Iron	11 / 11	20900	No SL	NA	Yes	No SL	NA
Lead	11 / 11	73	0.94	Avian	Yes	Exceeds benchmark	77.7
Magnesium	11 / 11	2220	NA	Nutrient	No	Nutrient	NA
Manganese	11 / 11	302	322	Mammal	No	Below benchmark	0.9
Mercury	1 / 11	0.052	0.1	Earthworm	No	Below benchmark	0.5
Nickel	11 / 11	37.7	30	Phyto	Yes	Exceeds benchmark	1.3
Potassium	9 / 11	< 604	NA	Nutrient	No	Below benchmark	NA
Selenium	5 / 11	2.5	0.331	Avian	Yes	Exceeds benchmark	7.6
Silver	4 / 11	1.3	2	Phyto	No	Below benchmark	0.7
Sodium	7 / 11	137	NA	Nutrient	No	Nutrient	NA
Thallium	1 / 11	0.087	0.027	Mammal	Yes	Exceeds benchmark	3.2
Uranium, total	4 / 4	2.6	5	Phyto	No	Below benchmark	0.5
Vanadium	11 / 11	28.7	0.714	Mammal	Yes	Exceeds benchmark	40.2
Zinc	11 / 11	68.9	12	Mammal	Yes	Exceeds benchmark	5.7

a. Hazard quotient > 1 but based on maximum detection limit.
No SL - No screening level available
"<" - Indicates maximum detection limit.
NA - Not applicable
COC - Contminant of Concern

Sources:
Mammal - NOAEL-based benchmark for food ingestion from Sample et al. 1996
Avian - NOAEL-based benchmark for food ingestion from Sample et al. 1996
Earthworm - Efroymson et al. (1997a)
Phyto - Efroymson et al. (1997b)

TABLE G-18
SEDIMENT COPC SCREENING
CHARTLEY SWAMP
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Sediment Concentration mg/kg	Ecological Sediment Screening Level[a] mg/kg	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
VOCs (mg/kg)							
1,1-Dichloroethene	0 / 6	< 0.02	No SL	NA	Yes	No SL	NA
1,2-Dichloroethene (total)	0 / 6	< 0.02	No SL	NA	Yes	No SL	NA
2-Butanone	0 / 6	< 0.02	No SL	NA	Yes	No SL	NA
Acetone	1 / 6	< 0.02	No SL	NA	Yes	No SL	NA
Carbon Disulfide	2 / 6	0.052	No SL	NA	Yes	No SL	NA
cis-1,2-Dichloroethene	0 / 6	< 0.02	No SL	NA	Yes	No SL	NA
Tetrachloroethene	0 / 6	< 0.02	4.3	SQB	No	Below benchmark	0.005
Toluene	0 / 6	< 0.02	5.4	SQB	No	Below benchmark	0.004
Trichloroethene	0 / 6	< 0.02	13.0	SQB	No	Below benchmark	0.002
Vinyl Chloride	0 / 6	< 0.02	No SL	NA	Yes	No SL	NA
SVOCs (mg/kg)							
2-Methylnaphthalene	0 / 6	< 0.6	No SL	NA	Yes	No SL	NA
4-Methylphenol	0 / 6	< 0.6	0.07	ER-L	Yes	Exceeds benchmark[f]	8.6
Acenaphthene	0 / 6	< 0.6	5.0	SQC	No	Below benchmark	0.1
Acenaphthylene	0 / 6	< 0.6	0.044	ER-L	Yes	Exceeds benchmark[f]	13.6
Anthracene	0 / 6	< 0.6	0.085	ER-L	Yes	Exceeds benchmark[b]	7.1
Benzo(a)anthracene	0 / 6	< 0.6	0.261	ER-L	Yes	Exceeds benchmark[b]	2.3
Benzo(a)pyrene	0 / 6	< 0.6	0.43	ER-L	Yes	Exceeds benchmark[b]	1.4
Benzo(b)fluoranthene	1 / 6	0.017	No SL	NA	Yes	No SL	NA
Benzo(g,h,i)perylene	0 / 6	< 0.6	1.4	OMOE-Low	No	Below benchmark	0.4
Benzo(k)fluoranthene	0 / 6	< 0.6	1.9	OMOE-Low	No	Below benchmark	0.3
bis(2-Ethylhexyl)phthalate	0 / 6	< 0.6	0.182	TEL	Yes	Exceeds benchmark[b]	3.3
Carbazole	0 / 6	< 0.6	No SL	NA	Yes	No SL	NA
Chrysene	1 / 6	0.018	0.384	ER-L	No	Below benchmark	0.05
Dibenz(a,h)anthracene	0 / 6	< 0.6	0.06	ER-L	Yes	Exceeds benchmark[b]	9.5
Dibenzofuran	0 / 6	< 0.6	16.2	SQB	No	Below benchmark	0.04
Diethylphthalate	0 / 6	< 0.6	5.1	SQB	No	Below benchmark	0.1
Di-n-butylphthalate	0 / 6	< 0.6	No SL	NA	Yes	No SL	NA
Di-n-octylphthalate	0 / 6	< 0.6	No SL	NA	Yes	No SL	NA
Fluoranthene	6 / 6	0.033	23.5	SQC	No	Below benchmark	0.0
Fluorene	0 / 6	< 0.6	4.4	SQB	No	Below benchmark	0.1
Indeno(1,2,3-cd)pyrene	0 / 6	< 0.6	0.2	OMOE-Low	Yes	Exceeds benchmark[b]	3.7
Naphthalene	0 / 6	< 0.6	0.16	ER-L	Yes	Exceeds benchmark[b]	3.8
Phenanthrene	6 / 6	0.017	6.9	SQC	No	Below benchmark	0.002
Phenol	1 / 6	0.087	No SL	NA	Yes	No SL	NA
Pyrene	6 / 6	0.027	0.66	ER-L	No	Below benchmark	0.04
PCBs/Pesticides (mg/kg)							
4,4'-DDD	0 / 6	< 0.006	0.002	ER-L	Yes	Bioaccumulates[b]	3.0
4,4'-DDE	0 / 6	< 0.006	0.0022	ER-L	Yes	Bioaccumulates[b]	2.7
4,4'-DDT	1 / 6	0.0024	0.00158	ER-L	Yes	Bioaccumulates	1.5
Aldrin	0 / 6	< 0.0031	0.016210111	OMOE-Low	Yes	Bioaccumulates	0.2
alpha-BHC	0 / 6	< 0.0031	0.048630333	OMOE-Low	Yes	Bioaccumulates	0.1
alpha-Chlordane	0 / 6	< 0.0031	0.0005	ER-L	Yes	Bioaccumulates[b]	6.2
Aroclor-1248	0 / 6	< 0.06	0.243151667	OMOE-Low	Yes	Bioaccumulates	0.2
Aroclor-1254	0 / 6	< 0.06	0.486303333	OMOE-Low	Yes	Bioaccumulates	0.1
Aroclor-1260	0 / 6	< 0.06	0.040525278	OMOE-Low	Yes	Bioaccumulates[b]	1.5
Dieldrin	0 / 6	< 0.006	0.421462889	SQC	Yes	Bioaccumulates	0.01
Endosulfan II	0 / 6	< 0.006	0.113470778	SQB	Yes	Bioaccumulates	0.1
Endosulfan sulfate	0 / 6	< 0.006	No SL	NA	Yes	Bioaccumulates	NA
Endrin	0 / 6	< 0.006	0.162101111	SQC	Yes	Bioaccumulates	0.04
Endrin aldehyde	0 / 6	< 0.006	No SL	NA	Yes	Bioaccumulates	NA
Endrin ketone	0 / 6	< 0.006	No SL	NA	Yes	Bioaccumulates	NA
gamma-Chlordane	0 / 6	< 0.0031	0.0005	ER-L	Yes	Bioaccumulates[b]	6.2
Heptachlor epoxide	0 / 6	< 0.0031	0.040525278	OMOE-Low	Yes	Bioaccumulates	0.1
Methoxychlor	0 / 6	< 0.031	0.153996056	SQB	Yes	Bioaccumulates	0.2

TABLE G-18
SEDIMENT COPC SCREENING
CHARTLEY SWAMP
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Sediment Concentration mg/kg	Ecological Sediment Screening Level[a] mg/kg	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
Metals (mg/kg)							
Aluminum	13 / 13	16,800	No SL	NA	Yes	No SL	NA
Antimony	6 / 13	< 6.8	2	ER-L	Yes	Exceeds benchmark	3.4
Arsenic	13 / 13	38	8.2	ER-L	Yes	Exceeds benchmark	4.6
Barium	13 / 13	61.2	No SL	NA	Yes	No SL	NA
Beryllium	12 / 13	98.5	No SL	NA	Yes	No SL	NA
Cadmium	6 / 13	82.1	1.2	ER-L	Yes	Exceeds benchmark	68.4
Calcium	13 / 13	6,960	Nutrient	NA	No	Nutrient	NA
Chromium	13 / 13	1,380	81	ER-L	Yes	Exceeds benchmark	17.0
Cobalt	11 / 13	432	No SL	NA	Yes	No SL	NA
Copper	8 / 13	553	34	ER-L	Yes	Exceeds benchmark	16.3
Cyanide	1 / 13	< 2.5	No SL	NA	Yes	No SL	NA
Iron	13 / 13	48,400	20,000	OMOE-Low	Yes	Exceeds benchmark	2.4
Lead	13 / 13	134	46.7	ER-L	Yes	Exceeds benchmark	2.9
Magnesium	13 / 13	2,400	Nutrient	NA	No	Nutrient	NA
Manganese	13 / 13	276	460	OMOE-Low	No	Below benchmark	0.6
Mercury	4 / 13	4.4	0.15	ER-L	Yes	Exceeds benchmark	29.3
Nickel	13 / 13	26,200	20.9	ER-L	Yes	Exceeds benchmark	1253.6
Potassium	12 / 13	659	Nutrient	NA	No	Nutrient	NA
Selenium	8 / 13	3.3	No SL	NA	Yes	No SL	NA
Silver	6 / 13	14.8	1	ER-L	Yes	Exceeds benchmark	14.8
Sodium	13 / 13	173	Nutrient	NA	No	Nutrient	NA
Thallium	4 / 13	< 0.77	No SL	NA	Yes	No SL	NA
Uranium, total	7 / 7	6.5	No SL	NA	Yes	No SL	NA
Vanadium	13 / 13	127	No SL	NA	Yes	No SL	NA
Zinc	13 / 13	20,800	150	ER-L	Yes	Exceeds benchmark	138.7

a. SQB, SQC, and OMOE-Low benchmark values (organics only) have been adjusted for a TOC of 8.1%.
b. Hazard quotient > 1 but based on maximum detection limit.
No SL - No screening level available
"<" - Indicates maximum detection limit.
NA - Not applicable
COC - Contminant of Concern

Sources in Order of Preference:
SQC - Sediment Quality Criteria. USEPA (1996) ECO Update, Ecotoxix Thresholds. Intermittent Bulletin Vol 3, No. 2.
SQB - Sediment Quality Benchmarks. USEPA (1996) ECO Update, Ecotox Thresholds. Intermittent Bulletin Vol 3, No. 2.
ER-L - NOAA Effects Range-Low, Long et al. (1995) as cited in in Jones, Sutter & Hull (1997)
OMOE-Low - Ontario Ministry of the Environment-Low, Persaud, et al. (1993) as cited in Jones, Sutter & Hull (1997)
TEL - Threshold Effects Levels, MacDonald (1994) as cited in Jones, Sutter & Hull (1997)

TABLE G-19
SURFACE WATER COPC SCREENING
CHARTLEY SWAMP
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Surface Water Concentration (ug/L)	Ecological Surface Water Screening Level[a] (ug/L)	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
VOCs (ug/L)							
1,1-Dichloroethene	0 / 4	< 10	25	SCV	No	Below benchmark	0.4
1,2-Dichloroethene (total)	0 / 4	< 10	590	SCV	No	Below benchmark	0.02
2-Butanone	0 / 4	< 10	14,000	SCV	No	Below benchmark	0.001
Acetone	1 / 4	7	1,500	SCV	No	Below benchmark	0.005
Carbon Disulfide	0 / 4	< 10	0.92	SCV	Yes	Exceeds benchmark[b]	10.9
Tetrachloroethene	0 / 4	< 10	120	ET-Tier II	No	Below benchmark	0.1
Toluene	0 / 4	< 10	130	ET-Tier II	No	Below benchmark	0.1
trans-1,2-Dichloroethene	0 / 4	< 10	590	SCV	No	Below benchmark	0.02
Trichloroethene	0 / 4	< 10	350	ET-Tier II	No	Below benchmark	0.03
Vinyl Chloride	0 / 4	< 10	No SL	NA	Yes	No SL	NA
SVOCs (ug/L)							
2-Methylnaphthalene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
4-Methylphenol	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Acenaphthene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Acenaphthylene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Anthracene	0 / 4	< 10	0.73	SCV	Yes	Exceeds benchmark[b]	13.7
Benzo(a)anthracene	0 / 4	< 10	0.027	SCV	Yes	Exceeds benchmark[b]	370.4
Benzo(a)pyrene	0 / 4	< 10	0.014	ET-Tier II	Yes	Exceeds benchmark[b]	714.3
Benzo(b)fluoranthene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Benzo(g,h,i)perylene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Benzo(k)fluoranthene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
bis(2-Ethylhexyl)phthalate	0 / 4	< 10	32	ET-Tier II	No	Below benchmark	0.3
Carbazole	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Chrysene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Dibenz(a,h)anthracene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Dibenzofuran	0 / 4	< 10	20	ET-Tier II	No	Below benchmark	0.5
Diethylphthalate	0 / 4	< 10	220	ET-Tier II	No	Below benchmark	0.05
Di-n-butylphthalate	0 / 4	< 10	33	ET-Tier II	No	Below benchmark	0.3
Di-n-octylphthalate	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Fluoranthene	1 / 4	0.2	No SL	NA	Yes	No SL	NA
Fluorene	0 / 4	< 10	3.9	ET-Tier II	Yes	Exceeds benchmark[b]	2.6
Indeno(1,2,3-cd)pyrene	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Naphthalene	0 / 4	< 10	24	ET-Tier II	No	Below benchmark	0.4
Phenanthrene	1 / 4	0.1	No SL	NA	Yes	No SL	NA
Phenol	0 / 4	< 10	No SL	NA	Yes	No SL	NA
Pyrene	1 / 4	0.2	No SL	NA	Yes	No SL	NA
PCBs/Pesticides (ug/L)							
4,4'-DDD	0 / 4	< 0.1	0.011	SCV	Yes	Bioaccumulates[b]	9.1
4,4'-DDE	0 / 4	< 0.1	No SL	NA	Yes	Bioaccumulates	NA
4,4'-DDT	0 / 4	< 0.1	0.001	AWQC	Yes	Bioaccumulates[b]	100.0
Aldrin	0 / 4	< 0.05	3	AWQC	Yes	Bioaccumulates	0.02
alpha-BHC	0 / 4	< 0.05	No SL	NA	Yes	Bioaccumulates	NA
alpha-Chlordane	0 / 4	< 0.05	0.0043	AWQC	Yes	Bioaccumulates[b]	11.6
Aroclor-1248	0 / 4	< 1	0.081	SCV	Yes	Bioaccumulates[b]	12.3
Aroclor-1254	0 / 4	< 1	0.033	SCV	Yes	Bioaccumulates[b]	30.3
Aroclor-1260	0 / 4	< 1	94	SCV	Yes	Bioaccumulates	0.01
Dieldrin	0 / 4	< 0.1	0.056	AWQC	Yes	Bioaccumulates[b]	1.8
Endosulfan I	0 / 4	< 0.05	0.056	ET-Tier II	Yes	Bioaccumulates	0.9
Endosulfan sulfate	0 / 4	< 0.1	No SL	NA	Yes	Bioaccumulates	NA
Endrin	0 / 4	< 0.1	0.036	AWQC	Yes	Bioaccumulates[b]	2.8
Endrin aldehyde	0 / 4	< 0.1	No SL	NA	Yes	Bioaccumulates	NA
Endrin ketone	0 / 4	< 0.1	No SL	NA	Yes	Bioaccumulates	NA
gamma-Chlordane	0 / 4	< 0.05	0.0043	AWQC	Yes	Bioaccumulates[b]	11.6
Heptachlor epoxide	0 / 4	< 0.05	0.0038	AWQC	Yes	Bioaccumulates[b]	13.2
Methoxychlor	0 / 4	< 0.5	0.03	AWQC	Yes	Bioaccumulates[b]	16.7

TABLE G-19
SURFACE WATER COPC SCREENING
CHARTLEY SWAMP
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Surface Water Concentration (ug/L)	Ecological Surface Water Screening Level[a] (ug/L)	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
Metals (ug/L)							
Aluminum - Dissolved	7 / 7	510	750	AWQC	No	Below benchmark[c]	0.7
Aluminum - Total	11 / 11	33300	750	AWQC	Yes	Exceeds benchmark	44.4
Antimony - Dissolved	7 / 7	0.9	30	SCV	No	Below benchmark	0.03
Antimony - Total	6 / 11	< 18	30	SCV	No	Below benchmark	0.6
Arsenic - Dissolved	3 / 7	< 2	150	AWQC	No	Below benchmark	0.01
Arsenic - Total	8 / 11	10.8	150	AWQC	No	Below benchmark	0.1
Barium - Dissolved	7 / 7	81.6	3.9	ET-Tier II	Yes	Exceeds benchmark	20.9
Barium - Total	11 / 11	217	3.9	ET-Tier II	Yes	Exceeds benchmark	55.6
Beryllium - Dissolved	2 / 7	21.3	5.1	ET-Tier II	Yes	Exceeds benchmark	4.2
Beryllium - Total	6 / 11	1480	5.1	ET-Tier II	Yes	Exceeds benchmark	290.2
Cadmium - Dissolved	2 / 7	14.9	0.33	AWQC	Yes	Exceeds benchmark	45.3
Cadmium - Total	6 / 11	121	0.37	AWQC	Yes	Exceeds benchmark	327.9
Calcium - Dissolved	7 / 7	283000	Nutrient	NA	No	Nutrient	NA
Calcium - Total	11 / 11	335000	Nutrient	NA	No	Nutrient	NA
Chromium - Dissolved	6 / 7	193	104	AWQC	Yes	Exceeds benchmark	1.8
Chromium - Total	9 / 11	13300	121	AWQC	Yes	Exceeds benchmark	109.5
Cobalt - Dissolved	7 / 7	515	3	ET-Tier II	Yes	Exceeds benchmark	171.7
Cobalt - Total	11 / 11	1960	3	ET-Tier II	Yes	Exceeds benchmark	653.3
Copper - Dissolved	4 / 7	55	12.8	AWQC	Yes	Exceeds benchmark	4.3
Copper - Total	8 / 11	4220	13.3	AWQC	Yes	Exceeds benchmark	316.3
Cyanide - Dissolved	0 / 7	< 10	5.2	AWQC	Yes	Exceeds benchmark[b]	1.9
Cyanide - Total	0 / 11	< 10	5	AWQC	Yes	Exceeds benchmark[b]	2.0
Iron - Dissolved	7 / 7	33100	1,000	AWQC	Yes	Exceeds benchmark	33.1
Iron - Total	11 / 11	270000	1,000	AWQC	Yes	Exceeds benchmark	270.0
Lead - Dissolved	6 / 7	6.2	4.0	AWQC	Yes	Exceeds benchmark	1.6
Lead - Total	9 / 11	868	5.4	AWQC	Yes	Exceeds benchmark	160.1
Magnesium - Dissolved	7 / 7	8730	Nutrient	NA	No	Nutrient	NA
Magnesium - Total	11 / 11	15800	Nutrient	NA	No	Nutrient	NA
Manganese - Dissolved	7 / 7	5320	80	ET-Tier II	Yes	Exceeds benchmark	66.5
Manganese - Total	11 / 11	5480	80	ET-Tier II	Yes	Exceeds benchmark	68.5
Mercury - Dissolved	1 / 7	0.29	0.77	AWQC	No	Below benchmark	0.4
Mercury - Total	4 / 11	41.1	0.91	AWQC	Yes	Exceeds benchmark	45.4
Nickel - Dissolved	7 / 7	8390	74	AWQC	Yes	Exceeds benchmark	113.2
Nickel - Total	11 / 11	235000	74	AWQC	Yes	Exceeds benchmark	3161.3
Potassium - Dissolved	7 / 7	5790	Nutrient	NA	No	Nutrient	NA
Potassium - Total	11 / 11	23350	Nutrient	NA	No	Nutrient	NA
Selenium - Dissolved	2 / 7	8.6	4.61	AWQC	Yes	Exceeds benchmark	1.9
Selenium - Total	0 / 11	< 3.8	5	AWQC	No	Below benchmark	0.8
Silver - Dissolved	4 / 7	1.135	0.36	SCV	Yes	Exceeds benchmark	3.2
Silver - Total	8 / 11	35.9	0.36	SCV	Yes	Exceeds benchmark	99.7
Sodium - Dissolved	7 / 7	18500	Nutrient	NA	No	Nutrient	NA
Sodium - Total	11 / 11	78150	Nutrient	NA	No	Nutrient	NA
Thallium - Dissolved	0 / 7	< 1	12	SCV	No	Below benchmark	0.1
Thallium - Total	0 / 11	< 2	12	SCV	No	Below benchmark	0.2
Uranium - Total	7 / 11	572.5	2.6	SCV	Yes	Exceeds benchmark	220.2
Vanadium - Dissolved	3 / 7	1.8	19	ET-Tier II	No	Below benchmark	0.1
Vanadium - Total	7 / 7	5.9	19	ET-Tier II	No	Below benchmark	0.3
Zinc - Dissolved	7 / 7	3840	168.45	AWQC	Yes	Exceeds benchmark	22.8
Zinc - Total	9 / 11	49900	171	AWQC	Yes	Exceeds benchmark	292.1

a. Screening values adjusted to a hardness of 152 mg/L $CaCO_3$.
b. Hazard quotient > 1 but based on maximum detection limit.
c. Screening value for aluminum is an acute value for Total/Unfiltered aluminum.
No SL - No screening level available
"<" - Indicates maximum detection limit.
NA - Not applicable
COC - Contminant of Concern

Sources in Order of Preference:
AWQC - Ambient Water Quality Criteria (USEPA, 2002)
ET-Tier II - Ecotox Thresholds (USEPA, 1996)
SCV - Secondary Chornic Value (Suter & Tsao, 1996)

TABLE G-20
SEDIMENT COPC SCREENING
ONSITE SEASONAL WETLANDS
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Sediment Concentration mg/kg	Ecological Sediment Screening Level[2] mg/kg	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
VOCs (mg/kg)							
1,1-Dichloroethene	3 / 15	< 0.031	No SL	NA	Yes	No SL	NA
1,2-Dichloroethene (total)	2 / 8	2.1	No SL	NA	Yes	No SL	NA
2-Butanone	5 / 15	< 0.031	No SL	NA	Yes	No SL	NA
Acetone	2 / 15	0.09	No SL	NA	Yes	No SL	NA
Carbon Disulfide	2 / 15	< 0.031	No SL	NA	Yes	No SL	NA
cis-1,2-Dichloroethene	5 / 7	6.4	No SL	NA	Yes	No SL	NA
Methyl Acetate	2 / 7	0.01425	No SL	NA	Yes	No SL	NA
Tetrachloroethene	1 / 15	< 0.031	2.1	SQB	No	Below benchmark	0.01
Toluene	1 / 15	< 0.031	2.7	SQB	No	Below benchmark	0.01
trans-1,2-Dichloroethene	2 / 7	0.013	No SL	NA	Yes	No SL	NA
Trichloroethene	5 / 15	10.45	6.5	SQB	Yes	Exceeds benchmark	1.6
Trichlorofluoromethane	1 / 7	< 0.012	No SL	NA	Yes	No SL	NA
Vinyl Chloride	2 / 15	0.13	No SL	NA	Yes	No SL	NA
SVOCs (mg/kg)							
1,1'-Biphenyl	1 / 7	0.077	4.5	SQB	No	Below benchmark	0.02
2-Methylnaphthalene	5 / 15	0.275	0.07	ER-L	Yes	Exceeds benchmark	3.9
4-Methylphenol	0 / 14	< 6.2	No SL	NA	Yes	No SL	NA
Acenaphthene	6 / 14	0.445	2.5	SQC	No	Below benchmark	0.2
Acenaphthylene	8 / 15	0.76	0.044	ER-L	Yes	Exceeds benchmark	17.3
Anthracene	10 / 15	4	0.085	ER-L	Yes	Exceeds benchmark	47.1
Benzaldehyde	2 / 7	0.053	No SL	NA	Yes	No SL	NA
Benzo(a)anthracene	9 / 14	16	0.261	ER-L	Yes	Exceeds benchmark	61.3
Benzo(a)pyrene	11 / 15	11.85	0.43	ER-L	Yes	Exceeds benchmark	27.6
Benzo(b)fluoranthene	12 / 15	19	No SL	NA	Yes	No SL	NA
Benzo(g,h,i)perylene	9 / 14	5.7	0.6885	OMOE-Low	Yes	Exceeds benchmark	8.3
Benzo(k)fluoranthene	12 / 15	10	0.972	OMOE-Low	Yes	Exceeds benchmark	10.3
bis(2-Ethylhexyl)phthalate	5 / 15	5.9	0.182	TEL	Yes	Exceeds benchmark	32.4
Carbazole	4 / 14	2.75	No SL	NA	Yes	No SL	NA
Chrysene	12 / 15	16	0.384	ER-L	Yes	Exceeds benchmark	41.7
Dibenz(a,h)anthracene	5 / 14	2.55	0.06	ER-L	Yes	Exceeds benchmark	40.2
Dibenzofuran	3 / 14	0.63	8.1	SQB	No	Below benchmark	0.1
Diethylphthalate	1 / 15	0.28	2.6	SQB	No	Below benchmark	0.1
Di-n-butylphthalate	4 / 15	1.5	No SL	NA	Yes	No SL	NA
Di-n-octylphthalate	0 / 14	0	No SL	NA	Yes	No SL	NA
Fluoranthene	14 / 15	26	11.7	SQC	Yes	Exceeds benchmark	2.2
Fluorene	7 / 15	0.84	2.187	SQB	No	Below benchmark	0.4
Indeno(1,2,3-cd)pyrene	9 / 14	5.5	0.081	OMOE-Low	Yes	Exceeds benchmark	67.9
m-Nitroaniline	0 / 6	< 16	No SL	NA	Yes	No SL	NA
Naphthalene	11 / 15	0.44	0.16	ER-L	Yes	Exceeds benchmark	2.8
o-Nitroaniline	0 / 6	< 16	No SL	NA	Yes	No SL	NA
o-Nitrophenol	0 / 6	< 6.2	No SL	NA	Yes	No SL	NA
Phenanthrene	14 / 15	16.5	3.4	SQC	Yes	Exceeds benchmark	4.8
Phenol	0 / 14	< 6.2	No SL	NA	Yes	No SL	NA
Pyrene	15 / 15	31	0.66	ER-L	Yes	Exceeds benchmark	47.0
PCBs/Pesticides (mg/kg)							
4,4'-DDD	4 / 14	0.046	0.002	ER-L	Yes	Bioaccumulates	23.0
4,4'-DDE	6 / 14	0.51	0.0022	ER-L	Yes	Bioaccumulates	231.8
4,4'-DDT	5 / 14	0.03	0.00158	ER-L	Yes	Bioaccumulates	19.0
Aldrin	1 / 14	0.00088	0.0081	OMOE-Low	Yes	Bioaccumulates	0.1
alpha-BHC	0 / 14	< 0.029	0.0243	OMOE-Low	Yes	Bioaccumulates[3]	1.2
alpha-Chlordane	3 / 14	0.0027	0.0005	ER-L	Yes	Bioaccumulates	5.4
Aroclor-1248	4 / 14	1.6	0.1215	OMOE-Low	Yes	Bioaccumulates	13.2
Aroclor-1254	8 / 15	84	0.243	OMOE-Low	Yes	Bioaccumulates	345.7
Aroclor-1260	5 / 14	0.28	0.02025	OMOE-Low	Yes	Bioaccumulates	13.8
Dieldrin	1 / 14	0.0065	0.2106	SQC	Yes	Bioaccumulates	0.03
Endosulfan II	1 / 14	0.00098	0.0567	SQB	Yes	Bioaccumulates	0.02
Endosulfan sulfate	3 / 14	0.006	No SL	NA	Yes	Bioaccumulates	NA
Endrin	2 / 14	0.047	0.081	SQC	Yes	Bioaccumulates	0.6
Endrin aldehyde	4 / 14	0.615	No SL	NA	Yes	Bioaccumulates	NA
Endrin ketone	2 / 14	0.0066	No SL	NA	Yes	Bioaccumulates	NA
gamma-Chlordane	5 / 14	0.625	0.0005	ER-L	Yes	Bioaccumulates	1250.0
Heptachlor epoxide	2 / 14	0.00098	0.02025	OMOE-Low	Yes	Bioaccumulates	0.05
Methoxychlor	4 / 14	0.021	0.07695	SQB	Yes	Bioaccumulates	0.3

TABLE G-20
SEDIMENT COPC SCREENING
ONSITE SEASONAL WETLANDS
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Sediment Concentration mg/kg	Ecological Sediment Screening Level[a] mg/kg	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
Metals (mg/kg)							
Aluminum	15 / 15	53,600	No SL	NA	Yes	No SL	NA
Antimony	8 / 15	491	2	ER-L	Yes	Exceeds benchmark	245.5
Arsenic	15 / 15	16.15	8.2	ER-L	Yes	Exceeds benchmark	2.0
Barium	15 / 15	4,060	No SL	NA	Yes	No SL	NA
Beryllium	12 / 15	233	No SL	NA	Yes	No SL	NA
Cadmium	11 / 15	75.3	1.2	ER-L	Yes	Exceeds benchmark	62.8
Calcium	15 / 15	167,000	Nutrient	NA	No	Nutrient	NA
Chromium	13 / 15	2,600	81	ER-L	Yes	Exceeds benchmark	32.1
Cobalt	14 / 15	422	No SL	NA	Yes	No SL	NA
Copper	15 / 15	17,800	34	ER-L	Yes	Exceeds benchmark	523.5
Cyanide	4 / 15	< 11.1	No SL	NA	Yes	No SL	NA
Iron	15 / 15	200,000	20,000	OMOE-Low	Yes	Exceeds benchmark	10.0
Lead	15 / 15	13,200	46.7	ER-L	Yes	Exceeds benchmark	282.7
Magnesium	15 / 15	40,700	Nutrient	NA	No	Nutrient	NA
Manganese	15 / 15	10,300	460	OMOE-Low	Yes	Exceeds benchmark	22.4
Mercury	11 / 15	30.7	0.15	ER-L	Yes	Exceeds benchmark	204.7
Nickel	15 / 15	31,800	20.9	ER-L	Yes	Exceeds benchmark	1521.5
Potassium	10 / 15	959	Nutrient	NA	No	Nutrient	NA
Selenium	5 / 15	7.7	No SL	NA	Yes	No SL	NA
Silver	11 / 15	374	1	ER-L	Yes	Exceeds benchmark	374.0
Sodium	12 / 15	1,470	Nutrient	NA	No	Nutrient	NA
Thallium	4 / 15	< 1.1	No SL	NA	Yes	No SL	NA
Vanadium	14 / 15	108	No SL	NA	Yes	No SL	NA
Zinc	15 / 15	38,000	150	ER-L	Yes	Exceeds benchmark	253.3

a. SQB, SQC, and OMOE-Low benchmark values (organics only) have been adjusted for a TOC of 4.1%
b. Hazard quotient > 1 but based on maximum detection limit.
No SL - No screening level available
"<" - Indicates maximum detection limit.
NA - Not applicable
COC - Contminant of Concern

Sources in Order of Preference:
SQC - Sediment Quality Criteria. USEPA (1996) ECO Update, Ecotoxix Thresholds. Intermittent Bulletin Vol 3, No. 2.
SQB - Sediment Quality Benchmarks. USEPA (1996) ECO Update, Ecotox Thresholds. Intermittent Bulletin Vol 3, No. 2.
ER-L - NOAA Effects Range-Low, Long et al. (1995) as cited in in Jones, Sutter & Hull (1997).
OMOE-Low - Ontario Ministry of the Environment-Low, Persaud, et al. (1993) as cited in Jones, Sutter & Hull (1997)
TEL - Threshold Effects Levels, MacDonald (1994) as cited in Jones, Sutter & Hull (1997)

TABLE G-21
SURFACE WATER COPC SCREENING
ONSITE SEASONAL WETLANDS
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Surface Water Concentration (ug/L)	Ecological Surface Water Screening Level[a] (ug/L)	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
VOCs (ug/L)							
1,1-Dichloroethene	0 / 9	< 10	25	SCV	No	Below benchmark	0.4
1,2,3-Trichlorobenzene	0 / 6	< 0.5	No SL	NA	Yes	No SL	NA
1,2-Dichloroethene (total)	0 / 3	< 10	590	SCV	No	Below benchmark	0.02
2-Butanone	0 / 9	< 10	14,000	SCV	No	Below benchmark	0.001
Acetone	1 / 9	130	1,500	SCV	No	Below benchmark	0.1
Carbon Disulfide	0 / 9	< 0.5	0.92	SCV	No	Below benchmark	0.5
cis-1,2-Dichloroethene	4 / 6	19	590	SCV	No	Below benchmark	0.03
Methyl Acetate	0 / 6	< 0.5	No SL	NA	Yes	No SL	NA
Tetrachloroethene	1 / 9	< 10	120	ET-Tier II	No	Below benchmark	0.1
Toluene	2 / 9	< 10	130	ET-Tier II	No	Below benchmark	0.1
trans-1,2-Dichloroethene	0 / 6	< 0.5	590	SCV	No	Below benchmark	0.001
Trichloroethene	2 / 9	< 10	350	ET-Tier II	No	Below benchmark	0.03
Trichlorofluoromethane	0 / 6	< 0.5	No SL	NA	Yes	No SL	NA
Vinyl Chloride	1 / 9	< 10	No SL	NA	Yes	No SL	NA
SVOCs (ug/L)							
1,1'-Biphenyl	0 / 6	< 6.3	14	SCV	No	Below benchmark	0.5
1,2,4,5-Tetrachlorobenzene	0 / 6	< 6.3	No SL	NA	Yes	No SL	NA
2-Methylnaphthalene	0 / 9	< 10	No SL	NA	Yes	No SL	NA
4-Methylphenol	2 / 9	0.3	No SL	NA	Yes	No SL	NA
Acenaphthene	1 / 9	0.1	No SL	NA	Yes	No SL	NA
Acenaphthylene	0 / 9	< 10	No SL	NA	Yes	No SL	NA
Anthracene	0 / 9	< 0.12	0.73	SCV	No	Below benchmark	0.2
Benzaldehyde	0 / 6	< 6.3	No SL	NA	Yes	No SL	NA
Benzo(a)anthracene	0 / 9	< 0.4	0.027	SCV	Yes	Below benchmark	14.8
Benzo(a)pyrene	2 / 9	0.4	0.014	ET-Tier II	Yes	Exceeds benchmark	28.6
Benzo(b)fluoranthene	2 / 9	< 10	No SL	NA	Yes	No SL	NA
Benzo(g,h,i)perylene	0 / 9	< 10	No SL	NA	Yes	No SL	NA
Benzo(k)fluoranthene	2 / 9	< 10	No SL	NA	Yes	No SL	NA
bis(2-Ethylhexyl)phthalate	1 / 9	1.1	32	ET-Tier II	No	Below benchmark	0.03
Carbazole	1 / 9	0.1	No SL	NA	Yes	No SL	NA
Chrysene	2 / 9	0.5	No SL	NA	Yes	No SL	NA
Dibenz(a,h)anthracene	0 / 9	< 10	No SL	NA	Yes	No SL	NA
Dibenzofuran	0 / 9	< 10	20	ET-Tier II	No	Below benchmark	0.5
Diethylphthalate	0 / 9	< 10	220	ET-Tier II	No	Below benchmark	0.0
Di-n-butylphthalate	0 / 9	< 10	33	ET-Tier II	No	Below benchmark	0.3
Di-n-octylphthalate	0 / 9	< 10	No SL	NA	Yes	No SL	NA
Fluoranthene	4 / 9	0.8	No SL	NA	Yes	No SL	NA
Fluorene	1 / 9	0.1	3.9	ET-Tier II	No	Below benchmark	0.03
Indeno(1,2,3-cd)pyrene	0 / 9	< 10	No SL	NA	Yes	No SL	NA
m-Nitroaniline	0 / 6	< 25	No SL	NA	Yes	No SL	NA
Naphthalene	0 / 9	< 10	24	ET-Tier II	No	Below benchmark	0.4
o-Nitroaniline	0 / 6	< 25	No SL	NA	Yes	No SL	NA
o-Nitrophenol	0 / 6	< 6.3	No SL	NA	Yes	No SL	NA
Phenanthrene	6 / 9	0.8	No SL	NA	Yes	No SL	NA
Phenol	0 / 9	< 10	No SL	NA	Yes	No SL	NA
Pyrene	2 / 9	0.9	No SL	NA	Yes	No SL	NA
PCBs/Pesticides (ug/L)							
4,4'-DDD	0 / 9	< 0.1	0.011	SCV	Yes	Bioaccumulates[b]	9.1
4,4'-DDE	1 / 9	0.012	No SL	NA	Yes	Bioaccumulates	NA
4,4'-DDT	0 / 8	< 0.1	0.001	AWQC	Yes	Bioaccumulates[b]	100.0
Aldrin	0 / 9	< 0.05	3	AWQC	Yes	Bioaccumulates	0.02
alpha-BHC	1 / 9	0.008125	No SL	NA	Yes	Bioaccumulates	NA
alpha-Chlordane	0 / 9	< 0.05	0.0043	AWQC	Yes	Bioaccumulates[b]	11.6
Aroclor-1248	0 / 9	< 1	0.081	SCV	Yes	Bioaccumulates[b]	12.3
Aroclor-1254	1 / 9	0.43	0.033	SCV	Yes	Bioaccumulates	13.0
Aroclor-1260	0 / 9	< 1	94	SCV	Yes	Bioaccumulates	0.01
Dieldrin	0 / 9	< 0.1	0.056	AWQC	Yes	Bioaccumulates[b]	1.8
Endosulfan I	0 / 9	< 0.05	0.056	ET-Tier II	Yes	Bioaccumulates[b]	0.9
Endosulfan sulfate	1 / 9	0.0065	No SL	NA	Yes	Bioaccumulates	NA
Endrin	0 / 9	< 0.1	0.036	AWQC	Yes	Bioaccumulates[b]	2.8
Endrin aldehyde	0 / 9	< 0.1	No SL	NA	Yes	Bioaccumulates	NA
Endrin ketone	0 / 9	< 0.1	No SL	NA	Yes	Bioaccumulates	NA
gamma-Chlordane	1 / 9	0.0031	0.0043	AWQC	Yes	Bioaccumulates	0.7
Heptachlor epoxide	0 / 9	< 0.05	0.0038	AWQC	Yes	Bioaccumulates[b]	13.2
Methoxychlor	0 / 9	< 0.5	0.03	AWQC	Yes	Bioaccumulates[b]	16.7

TABLE G-21
SURFACE WATER COPC SCREENING
ONSITE SEASONAL WETLANDS
Shpack Superfund Site
Norton, Attleboro, MA

Analyte	Frequency of Detection	Maximum Surface Water Concentration (ug/L)	Ecological Surface Water Screening Level[a] (ug/L)	Source of Ecological Screening Level	COC?	Reason	Hazard Quotient
Metals (ug/L)							
Aluminum - Dissolved	0 / 6	< 9	750	AWQC	No	Below benchmark[c]	0.01
Aluminum - Total	9 / 9	6420	750	AWQC	Yes	Exceeds benchmark	8.6
Antimony - Dissolved	6 / 6	0.65	30	SCV	No	Below benchmark	0.02
Antimony - Total	8 / 9	36	30	SCV	Yes	Exceeds benchmark	1.2
Arsenic - Dissolved	0 / 6	< 0.5	150	AWQC	No	Below benchmark	0.0
Arsenic - Total	1 / 9	2.3	150	AWQC	No	Below benchmark	0.0
Barium - Dissolved	6 / 6	3190	3.9	ET-Tier II	Yes	Exceeds benchmark	818
Barium - Total	9 / 9	7500	3.9	ET-Tier II	Yes	Exceeds benchmark	1,923
Beryllium - Dissolved	0 / 6	< 0.2	5.1	ET-Tier II	No	Below benchmark	0.04
Beryllium - Total	0 / 9	< 1	5.1	ET-Tier II	No	Below benchmark	0.2
Cadmium - Dissolved	1 / 6	0.43	0.48	AWQC	No	Below benchmark	0.9
Cadmium - Total	8 / 9	39.5	0.55	AWQC	Yes	Exceeds benchmark	71
Calcium - Dissolved	6 / 6	154000	Nutrient	NA	No	Nutrient	NA
Calcium - Total	9 / 9	167000	Nutrient	NA	No	Nutrient	NA
Chromium - Dissolved	5 / 6	1.4	164	AWQC	No	Below benchmark	0.01
Chromium - Total	6 / 9	< 6.9	190	AWQC	No	Below benchmark	0.04
Cobalt - Dissolved	2 / 6	6.4	3	ET-Tier II	Yes	Exceeds benchmark	2.1
Cobalt - Total	5 / 9	70.4	3	ET-Tier II	Yes	Exceeds benchmark	23.5
Copper - Dissolved	5 / 6	14.8	20.5	AWQC	No	Below benchmark	0.7
Copper - Total	8 / 9	891	21.3	AWQC	Yes	Exceeds benchmark	42
Cyanide - Dissolved	0 / 6	< 5	5.2	AWQC	No	Below benchmark	0.96
Cyanide - Total	0 / 9	< 10	5.2	AWQC	Yes	Exceeds benchmark[b]	1.9
Iron - Dissolved	6 / 6	267.5	1,000	AWQC	No	Below benchmark	0.3
Iron - Total	9 / 9	50800	1,000	AWQC	Yes	Exceeds benchmark	50.8
Lead - Dissolved	6 / 6	21.3	7.1	AWQC	Yes	Exceeds benchmark	3.0
Lead - Total	9 / 9	160	10.9	AWQC	Yes	Exceeds benchmark	14.7
Magnesium - Dissolved	6 / 6	24700	Nutrient	NA	No	Nutrient	NA
Magnesium - Total	9 / 9	37400	Nutrient	NA	No	Nutrient	NA
Manganese - Dissolved	6 / 6	1000	80	ET-Tier II	Yes	Exceeds benchmark	12.5
Manganese - Total	9 / 9	2570	80	ET-Tier II	Yes	Exceeds benchmark	32.1
Mercury - Dissolved	0 / 6	< 0.14	0.77	AWQC	No	Below benchmark	0.2
Mercury - Total	2 / 9	1.1	0.77	AWQC	Yes	Below benchmark	1.4
Nickel - Dissolved	6 / 6	135	118	AWQC	Yes	Exceeds benchmark	1.1
Nickel - Total	9 / 9	1780	118	AWQC	Yes	Exceeds benchmark	15.1
Potassium - Dissolved	6 / 6	24200	Nutrient	NA	No	Nutrient	NA
Potassium - Total	9 / 9	59300	Nutrient	NA	No	Nutrient	NA
Selenium - Dissolved	1 / 6	7.6	4.6	AWQC	Yes	Exceeds benchmark	1.7
Selenium - Total	2 / 9	7.95	5	AWQC	Yes	Exceeds benchmark	1.6
Silver - Dissolved	0 / 6	< 0.8	0.36	SCV	Yes	Exceeds benchmark	2.2
Silver - Total	2 / 9	26.2	0.36	SCV	Yes	Exceeds benchmark	72.8
Sodium - Dissolved	6 / 6	47900	Nutrient	NA	No	Nutrient	NA
Sodium - Total	9 / 9	125000	Nutrient	NA	No	Nutrient	NA
Thallium - Dissolved	0 / 6	< 0.34	12	SCV	No	Below benchmark	0.03
Thallium - Total	0 / 9	< 2	12	SCV	No	Below benchmark	0.2
Vanadium - Dissolved	6 / 6	6.9	19	ET-Tier II	No	Below benchmark	0.4
Vanadium - Total	7 / 9	148	19	ET-Tier II	Yes	Exceeds benchmark	7.8
Zinc - Dissolved	6 / 6	40.9	268	AWQC	No	Below benchmark	0.2
Zinc - Total	8 / 9	5470	272	AWQC	Yes	Exceeds benchmark	20.1

a. Screening values adjusted to a hardness of 263 mg/L $CaCO_3$.
b. Hazard quotient > 1 but based on maximum detection limit.
c. Screening value for aluminum is an acute value for Total/Unfiltered aluminum.
No SL - No screening level available
"<" - Indicates maximum detection limit.
NA - Not applicable
COC - Contminant of Concern

Sources in Order of Preference
AWQC - Ambient Water Quality Criteria (USEPA, 2002)
ET-Tier II - Ecotox Thresholds (USEPA, 1996)
SCV- Secondary Chronic Value (Suter & Tsao, 1996)

endpoints, and measurement endpoints are summarized below in Table G-22 (hardwood forest), Table G-23 (Chartley Swamp), and Table G-24 (onsite seasonal wetlands).

Potential risk from COCs to assessment populations was estimated using dietary exposure models. Because site-specific tissue data were not available, doses were modeled from soil, sediment, and surface water concentrations. To assist in exposure estimation for small terrestrial mammals and songbirds, COC concentrations in prey (earthworms) were modeled directly from COC concentrations in soil. To assist in exposure estimation for semi-aquatic mammals, waterfowl, and marsh wren, COC concentrations in prey (oligocheates) were modeled directly from COC concentrations in sediment. COC concentrations in dietary vegetation were also modeled to assist exposure estimation for these five indicator species. Risk to bottom dwelling fish was evaluated by modeling tissue concentrations from measured sediment concentrations. Risk to benthic invertebrates was evaluated by comparing sediment concentrations to sediment ecological benchmarks.

Short-tailed shrew (*Blarina brevicauda*), representing small mammals, and American robin (*Turdus migratorius*), representing songbirds, were selected as assessment populations to evaluate risks associated with exposure to COCs in hardwood forest soil. Muskrat (*Ondatra zibethicus*), representing semi-aquatic mammals, and mallards (*Anas platyrhynchos*), representing waterfowl, were selected as assessment populations to evaluate risks associated with exposure to COCs in Chartley Swamp sediment and surface water. In addition, risk to fish, represented by brown bullhead (*Ameiurus nebulosus*), and risk to benthic invertebrates, were also evaluated in Chartley Swamp. Short-tailed shrew (*Blarina brevicauda*), representing small mammals, and marsh wren (*Cistothorus palustris*), representing wetland songbirds were selected as assessment populations to evaluate risks associated with exposure to COCs in onsite seasonal wetland sediment and surface water. In addition, risk to benthic invertebrates was also evaluated in the onsite seasonal wetlands.

For each assessment population, an average exposure case and a maximum exposure case were calculated. The average case was an exposure model based on (arithmetic) mean COC concentrations. The maximum exposure case was an exposure model based on the upper confidence limit (UCL) of COC concentrations.

Chartley Swamp was assessed for three exposure scenarios: the inner rung, outer rung, and site-wide scenario. See Figure 5 for the approximate location of the inner and outer rung of Chartley Swamp. The distinction was based on apparent geographic differences in contaminant concentrations. The inner rung is an area of Chartley Swamp which lies adjacent to the highly contaminated Tongue Area, where COC concentrations were as much as three orders of magnitude higher than the concentrations at sediment locations in the rest of Chartley Swamp. The area of Chartley Swamp which is not part of the inner rung comprises the outer rung. The inner rung and outer rung combine to form the site-wide scenario. In the hardwood forest and the onsite seasonal wetlands, concentrations of COCs in sediments were relatively uniform, so these exposure areas were not divided into separate sub-areas.

Table G-22
Ecological Exposure Pathways of Concern – Hardwood Forest

Exposure Medium	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Soil	N	Small terrestrial mammals	N	Ingestion and direct contact with chemicals in soil.	Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals	Compare modeled exposures to published values which are indicative of potential impairment.
Soil	N	Songbirds	N	Ingestion and direct contact with chemicals in soil.	Sustainability (survival, growth, reproduction) of local populations of songbirds	Compare modeled exposures to published values which are indicative of potential impairment.

Table G-23
Ecological Exposure Pathways of Concern – Chartley Swamp

Exposure Medium	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Sediment and Surface Water	N	Semi-aquatic mammals	N	Ingestion and direct contact with chemicals in sediment and surface water.	Sustainability (survival, growth, reproduction) of local populations of semi-aquatic mammals	Compare modeled exposures to published values which are indicative of potential impairment.
Sediment and Surface Water	N	Waterfowl	N	Ingestion and direct contact with chemicals in sediment and surface water.	Sustainability (survival, growth, reproduction) of local populations of waterfowl	Compare modeled exposures to published values which are indicative of potential impairment.
Sediment and Surface Water	N	Bottom dwelling fish	N	Ingestion and direct contact with chemicals in sediment and surface water.	Sustainability (survival, growth, reproduction) of local populations of bottom dwelling fish	Compare modeled exposures to published values which are indicative of potential impairment.
Sediment and Surface Water	N	Benthic invertebrates	N	Ingestion and direct contact with chemicals in sediment and surface water.	Sustainability (survival, growth, reproduction) of local populations of benthic invertebrates	Compare chemical concentrations in medium to sediment toxicity benchmarks. Indicative of potential impairment.

Table G-24
Ecological Exposure Pathways of Concern – Onsite Seasonal Wetland

Exposure Medium	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Soil	N	Small terrestrial mammals	N	Ingestion and direct contact with chemicals in soil.	Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals	Compare modeled exposures to published values which are indicative of potential impairment.
Sediment and Surface Water	N	Wetland songbirds	N	Ingestion and direct contact with chemicals in sediment and surface water.	Sustainability (survival, growth, reproduction) of local populations of wetland songbirds	Compare modeled exposures to published values which are indicative of potential impairment.
Sediment and Surface Water	N	Benthic invertebrates	N	Ingestion and direct contact with chemicals in sediment and surface water.	Sustainability (survival, growth, reproduction) of local populations of benthic invertebrates	Compare chemical concentrations in medium to sediment toxicity benchmarks indicative of potential impairment.

Ecological Effects Assessment

Modeled doses were compared to toxicity reference values (TRVs) obtained from the literature. TRVs were predominantly selected from studies which reported no-observed-adverse-effects-levels (NOAELs). When a suitable NOAEL was unavailable, studies which reported lowest-observed-adverse-effects-levels (LOAELs) were used and adjusted downward with an uncertainty factor of 10. The LOAEL to NOAEL adjustment was the only calculation in which an uncertainty factor was used. Hazard quotients (HQs) were then calculated for each COC using the modeled doses and NOAEL TRVs. Risk to shrew, robin, muskrat, mallard, and marsh wren was based on magnitude of the HQs and an assessment of the uncertainty associated with the HQs. COCs which showed risk based on these factors in the maximum (UCL) case were identified as exceeding lower risk thresholds. When COCs exceeded lower risk thresholds, a second set of HQs was calculated using LOAEL TRVs and the average case. COCs which showed risk based on LOAEL TRVs and the average case were identified as exceeding upper risk thresholds.

Several COCs lacked avian TRVs (especially VOCs and SVOCs); when avian TRVs were not available, mammalian TRVs were used as surrogate values to calculate HQs. When mammalian TRVs were not available for a COC, HQs could not be calculated.

Risk to fish was evaluated by modeling tissue concentrations from measured sediment concentrations. Hazard quotients were then calculated for each COC using the modeled doses and no-observed-effects-dose (NOED) and lowest-observed-effects-dose (LOED) TRVs indicative of potential harm. Risk to fish was based on magnitude of the HQs and an assessment of the uncertainty associated with the estimates. Risk to benthic invertebrates was evaluated by comparing sediment concentrations to sediment ecological benchmarks within the context of SEM-AVS data. Whether COCs exceeded lower risk thresholds or upper risk thresholds for benthic invertebrates was based on exceedences of benchmark values.

Risk Characterization

In the hardwood forest, risk to small mammals and songbirds is not actionable because no COCs exceed upper risk thresholds. In Chartley Swamp, only the inner rung scenario demonstrated actionable risk to semi-aquatic mammals, waterfowl, bottom dwelling fish, and benthic macro invertebrates; risk in the inner rung was associated with concentrations of inorganics. In the onsite seasonal wetlands, risk to small mammals, wetland songbirds, and benthic invertebrates was associated with concentration of SVOCs, pesticides/PCBs, and inorganics which exceeded upper risk thresholds.

The goal of the risk description is to identify a threshold concentration (also called threshold effects levels, or TELs) at which ecological effects are likely to occur. A TEL is a daily dose resulting in a hazard quotient (HQ) of 1.0. Since food COC concentrations were estimated from soil and sediment concentrations, the food chain models were used to back-calculate a soil or sediment concentration that corresponds to a daily dose resulting in an HQ of 1.0. This approach assumes that concentrations are evenly distributed throughout the site or foraging area. TELs are summarized below (Table G-25 though Table G-27) for those COCs which exceed upper risk thresholds. TELs were based on LOAELs and the average case; if LOAELs were not available then TELs were based on NOAELs and the average case.

TELs for the benthic invertebrate community have not been calculated at this time. Site specific toxicity testing will be conducted during pre-design efforts to ensure that the selected cleanup standards are protective of this community. As part of remedial design toxicity testing will be conducted in Chartley Swamp and the onsite seasonal wetlands to confirm that the selected sediment cleanup levels are protective of the benthic community.

3. Basis for Response Action

Because the baseline human health and ecological risk assessments revealed that ecological and human receptors potentially exposed to contaminants of concern in soil, sediment and groundwater via ingestion or direct exposure may present an unacceptable human health risk of 10^{-4} excess cancer risk and/or a Hazard Index of HI of 1.0 or greater, or unacceptable ecological risk; actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

In order to address these risks, the focus of the remedial action is on soil and sediment media in which COCs are present above the site cleanup levels listed in Tables L-1, L-2, and L-3 of this ROD.

Table G-25
COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors in the Hardwood Forest

Habitat Type/ Name	Exposure Medium	COC	Protective Level	Units	Basis	Assessment Endpoint
Hardwood Forest	Soil	None	NA	NA	Food chain models, LOAEL	Sustainability (survival, growth; reproduction) of local populations of small terrestrial mammals
	Soil	None	NA	NA	Food chain models, LOAEL	Sustainability (survival, growth, reproduction) of local populations of small songbirds.

Table G-26
COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors in Chartley Swamp

Habitat Type/ Name	Exposure Medium	COC	Protective Level	Units	Basis	Assessment Endpoint
Chartley Swamp	Sediment	Arsenic	8.4	mg/kg	Food chain models, LOED	Sustainability (survival, growth reproduction) of local populations of bottom dwelling fish
		Cadmium	6.2	mg/kg	Food chain models, LOED	
		Copper	41	mg/kg	Food chain models, LOED	
		Lead	32	mg/kg	Food chain models, LOED	
		Mercury	0.89	mg/kg	Food chain models, LOED	
		Silver	0.89	mg/kg	Food chain models, LOED	
	Sediment	Beryllium	45	mg/kg	Food chain models, NOAEL	Sustainability (survival, growth, reproduction) of local populations of semi-aquatic mammals
		Cadmium	170	mg/kg	Food chain models, LOAEL	
		Copper	246	mg/kg	Food chain models, LOAEL	
		Mercury	1.9	mg/kg	Food chain models, LOAEL	
		Nickel	7,805	mg/kg	Food chain models, LOAEL	
		Zinc	1,591	mg/kg	Food chain models, LOAEL	
	Sediment	Beryllium	45	mg/kg	Food chain models, NOAEL	Sustainability (survival, growth, reproduction) of local populations of waterfowl
		Cadmium	757	mg/kg	Food chain models, LOAEL	
		Chromium	2,679	mg/kg	Food chain models, LOAEL	
		Mercury	1.8	mg/kg	Food chain models, LOAEL	
		Zinc	3,114	mg/kg	Food chain models, LOAEL	
	Sediment				Toxicity testing to be conducted during predesign studies 1.	Sustainability (survival, growth, reproduction) of local populations of benthic invertebrates

1. A pre-design study will include toxicity testing confirm that selected cleanup goals for sediment concentrations are protective of the benthic invertebrate community. See text for a more detailed discussion of toxicity testing.

Table G-27
COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors in the onsite seasonal Wetlands

Habitat Type/ Name	Exposure Medium	COC	Protective Level	Units	Basis	Assessment Endpoint
Onsite Seasonal Wetlands	Soil	Benzo(a)anthracene	1.2	mg/kg	Food chain models, LOAEL	Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals
		Benzo(a)pyrene	1.3	mg/kg	Food chain models, LOAEL	
		Benzo(b)fluoranthene	1.3	mg/kg	Food chain models, LOAEL	
		Benzo(k)fluoranthene	1.3	mg/kg	Food chain models, LOAEL	
		Chrysene	1.3	mg/kg	Food chain models, LOAEL	
		Dibenz(a,h)anthracene	1.3	mg/kg	Food chain models, LOAEL	
		Indeno(1,2,3)pyrene	1.3	mg/kg	Food chain models, LOAEL	
		Aroclor-1254	0.27	mg/kg	Food chain models, LOAEL	
		Antimony	49	mg/kg	Food chain models, LOAEL	
		Arsenic	188	mg/kg	Food chain models, LOAEL	
		Barium	853	mg/kg	Food chain models, NOAEL	
		Beryllium	23	mg/kg	Food chain models, NOAEL	
		Cadmium	136	mg/kg	Food chain models, LOAEL	
		Copper	5,606	mg/kg	Food chain models, LOAEL	
		Lead	15,110	mg/kg	Food chain models, LOAEL	
		Mercury	33	mg/kg	Food chain models, LOAEL	
		Nickel	31,845	mg/kg	Food chain models, LOAEL	
		Silver	522	mg/kg	Food chain models, NOAEL	
		Vanadium	448	mg/kg	Food chain models, LOAEL	
		Zinc	25,175	mg/kg	Food chain models, LOAEL	
	Sediment	Benzo(a)anthracene	2.7	mg/kg	Food chain models, LOAEL	Sustainability (survival, growth, reproduction) of local populations of wetland songbirds
		Benzo(a)pyrene	2.7	mg/kg	Food chain models, LOAEL	
		Benzo(b)fluoranthene	2.7	mg/kg	Food chain models, LOAEL	
		Benzo(k)fluoranthene	2.7	mg/kg	Food chain models, LOAEL	
		Chrysene	2.7	mg/kg	Food chain models, LOAEL	

Habitat Type/ Name	Exposure Medium	COC	Protective Level	Units	Basis	Assessment Endpoint
		Dibenz(a,h)anthracene	2.3	mg/kg	Food chain models, LOAEL	
		Indeno(1,2,3)pyrene	2.3	mg/kg	Food chain models, LOAEL	
		DDT	0.027	mg/kg	Food chain models, LOAEL	
		Aroclor-1254	1.6	mg/kg	Food chain models, LOAEL	
		Antimony	39	mg/kg	Food chain models, LOAEL	
		Beryllium	5	mg/kg	Food chain models, NOAEL	
		Cadmium	103	mg/kg	Food chain models, LOAEL	
		Chromium	427	mg/kg	Food chain models, LOAEL	
		Copper	122	mg/kg	Food chain models, LOAEL	
		Lead	551	mg/kg	Food chain models, LOAEL	
		Mercury	0.26	mg/kg	Food chain models, LOAEL	
		Nickel	7,943	mg/kg	Food chain models, LOAEL	
		Silver	187	mg/kg	Food chain models, NOAEL	
		Zinc	437	mg/kg	Food chain models, LOAEL	
	Sediment				Toxicity testing to be conducted during predesign studies.1	Sustainability (survival, growth, reproduction) of local populations of benthic invertebrates

1. A pre-design study will include toxicity testing confirm that selected cleanup goals for sediment concentrations are protective of the benthic invertebrate community. See text for a more detailed discussion of toxicity testing.

H. REMEDIATION OBJECTIVES

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, response action objectives (RAOs) were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment. The RAOs for the selected remedy for the Shpack Landfill Superfund Site are:

Source Control:

Soil

•Prevent Ingestion/direct contract with soil having non-carcinogens in excess of a Hazard Index (HI) of 1 or with soil having carcinogens posing excess cancer risk above 10 -4 to 10 -6 and meet ARARs.

•Prevent inhalation of carcinogens posing excess cancer risk levels above 10-4 to 10-6 or a hazard index of 1.0 and meet ARARs.

•Prevent exposure to contaminants in soil that present an unacceptable risk to the environment.

Sediment

- Prevent exposure to sediment having carcinogens posing excess cancer risk above 10-4 to 10-6 or a hazard index of 1.0.

- Prevent exposure to contaminants in sediment that present an unacceptable risk to the environment.

Surface Water

- Prevent migration of contamination from site to surface water to reduce to the extent practicable the contribution of contamination from the site to surface waters of contamination that presents an unacceptable risk to human health and the environment.

Management of Migration

- Prevent Ingestion of groundwater having carcinogens in excess of MCLs, non-zero MCLGs, and a total excess cancer risk for all contaminants in groundwater greater that 10-4 to 10-6.

- Prevent ingestion of groundwater having non-carcinogens in excess of MCLs or non-zero MCLGs or a hazard index of 1.0.

- Prevent exposure to contaminants in groundwater that present an unacceptable risk to the environment

I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these congressional mandates.

B. Technology and Alternative Development and Screening

CERCLA and the National Contingency Plan (NCP) set forth the process by which remedial actions are evaluated and selected. As discussed in Section 2 of the FS, soil technology options were identified, assessed and screened based on implementability, effectiveness, and cost. These technologies were combined into source control (SC) alternatives. Section 3 of the FS presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 4 of the FS.

In summary, two source control remedial alternatives screened in Section 2 were retained as possible options for the cleanup of the Site. As discussed earlier, these alternatives were then developed based upon four future use scenarios.

With respect to ground water response action, the RI/FS developed a limited number of remedial alternatives. However, based on site-specific conditions, the FS concluded that groundwater remediation was infeasible at the time the FS was prepared from a cost, effectiveness and implementability perspective based on the following:

- ***Proximity to a Significant Offsite Source*** – As documented in the RI, chemically impacted landfill materials from the ALI Landfill extend onto the southwestern portion of the Shpack Site. The highest concentration of VOCs in groundwater detected during the RI were located upgradient on the ALI Landfill. This indicates that a significant VOC source is located beneath the ALI Landfill. Because of this, groundwater remediation (i.e., pump and treat) would be ineffective because a significant source of groundwater contamination remains unaddressed. Until this offsite, upgradient source is adequately addressed, groundwater remediation at Shpack would be ineffective.

- ***High Probability for COPC Partitioning*** Due to the high organic carbon contents of shallow aquifer sediments, the majority of contaminant mass is likely adsorbed onto aquifer solids, limiting the effectiveness of groundwater restoration. The high contaminant sorption onto soil and sediment inhibit contaminant movement in the aquifer and would increase the restoration time frame for groundwater remedial activities.

In addition, EPA has determined that groundwater will not be used in the future for drinking water, etc. See Section D of the ROD for additional discussion. As a result, groundwater cleanup alternatives were not addressed in the Detailed Analysis of the FS.

J. DESCRIPTION OF ALTERNATIVES

Detailed Analysis of Alternatives

This section presents the detailed analysis of remedial action alternatives that were retained from the screening performed in Section 2 of the FS. The detailed analysis performed as part of the FS was conducted in accordance with CERCLA Section 121, the NCP and USEPA RI/FS Guidance. Costs presented in this section are based on existing site data and will be reevaluated as part of the Remedial Design/Remedial Action (RD/RA) Phase. In accordance with USEPA RI/FS Guidance, costs presented in this section are intended to be within the target range of -30% to +50% of the actual cost of the remedial alternative as described.

Evaluation Criteria

This section presents a summary of the nine criteria used to evaluate the appropriate remedial alternative for the Site. The nine criteria are broken down into three categories and are summarized as follows:

Threshold Criteria relate directly to statutory findings that must be made in the Record Of Decision. These criteria include:

- Overall protection of human health and the environment; and
- Compliance with ARARs

Balancing Criteria refer to five of the evaluation criteria that represent the primary criteria upon which the detailed evaluation is performed. These criteria include:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility or volume;
- Short-term effectiveness;
- Implementability; and
- Cost.

Modifying criteria are evaluated following comment on the FS and the proposed plan. These criteria were not evaluated as part of the FS and include:

- State acceptance; and,
- Community acceptance.

A description of the major components of each alternative, the costs for each alternative, and comparison to the nine criteria is provided below.

ALTERNATIVE SC-1: NO ACTION

Under this alternative, no remedial technologies would be implemented at the Site to reduce soil or sediment concentrations in the source area. As a result, the only decreases in COPC concentrations would occur from naturally occurring degradation processes.

A comparison of this alternative to the criteria established in the NCP is included as Table 7 of the FS. As shown in Table 8 of the FS, there are no costs associated with the No Action alternative.

This alternative does not meet ARAR requirements for radiological and chemical source material.

ALTERNATIVE SC-2: MULTI-BARRIER CAP/EXCAVATION/OFF-SITE DISPOSAL OF PCBs, DIOXIN, RADIOLOLOGICAL MATERIAL

This alternative includes installing a multi-barrier landfill cap to limit water infiltration and subsequent migration of contaminants, and excavation and off-site disposal of radiological, PCB and dioxin material exceeding Cleanup levels. This alternative eliminates the exposure pathways of soil and sediment dermal contact and ingestion. The capping portion of this alternative was included as part of the FS to comply with the Federal RCRA ARAR requirements for implementation of an appropriately designed landfill cap at Superfund sites. The landfill would be designed and installed in accordance with 40 CFR 264 Subpart G (closure and post-closure); and 40 CFR 264 Subpart N (landfills).

Figure 4 of the FS displays the estimated excavation areas exceeding Cleanup Levels for each of the risk scenarios evaluated in the FS, and Figure 5 of the FS shows areas with ecological risk. Table 6 displays a summary of the volumes of impacted material for each risk scenario. Under each risk scenario, the amount of soil to be excavated varies; however, the general excavation and disposal method is consistent.

A comparison of Alternative SC-2 to seven of the nine NCP criteria is provided on Table 9 of the FS. A detailed cost estimate for Alternatives SC-2A through SC-2D is provided on Tables 10A through Table 10D of the FS. The total estimated cost for various risk scenarios under this alternative were estimated as follows:

•SC-2A - Recreational User – $26,057,000
•SC-2B - Adjacent Resident without GW consumption – $28,106,000
•SC-2C - Adjacent Resident with GW consumption – $94,514,000
•SC-2D - Onsite Resident – $98,066,000

All costs include 30 years of operation, maintenance and monitoring. The ARARs associated with this alternative are shown in Table 1C of the FS. The estimated time for construction of the SC-2 alternative given by the FS is 18-25 months.

Expected Outcomes

The outcome is dependent upon the risk exposure scenario selected. Restrictions would be placed on the Site to protect the integrity of the cap in the future. Groundwater restrictions would also be necessary.

ALTERNATIVE SC-3: EXCAVATION AND OFFSITE DISPOSAL

Under this alternative, all source area materials exceeding Cleanup Levels will be excavated and transported for offsite disposal. As a result, this alternative would provide permanent elimination of contaminants exceeding Cleanup levels at the Site.

Figure 4 of the FS displays the estimated excavation areas exceeding Cleanup levels for each of the risk scenarios evaluated in the FS, and Figure 5 of the FS shows areas exceeding ecological risk Cleanup levels. Table 6 of the FS displays a summary of the volumes of impacted material for each risk scenario. Under each risk scenario, the amount of soil excavated varies; however, the general excavation and disposal method is consistent.

A comparison of Alternatives SC-3A through SC-3D to seven of the nine NCP criteria is provided on Table 11 of the FS. A detailed estimate of costs associated with each of the risk scenarios associated with this alternative is provided as Tables 12A through Table 12B of the FS.

The total estimated costs for each of the risk scenarios associated with this alternative are as follows:

•SC-3A - Recreational User – $54,055,000
•SC-3B - Adjacent Resident without GW consumption – $55,553,000[3]
•SC-3C - Adjacent Resident with GW consumption – $120,888,000
•SC-3D - Onsite Resident – $126,868,000

The ARARs associated with this alternative are shown in Table 1G of the FS.
The estimated time for construction given in the FS is 9-16 months.

Expected Outcomes

The outcome is dependent upon the risk exposure scenario selected. Groundwater restrictions would also be necessary.

[3] This cost was later revised downward to $43,034,000. See Section L for more information.

K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These criteria are summarized as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP:

1. Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

3. Long-term effectiveness and permanence addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. Reduction of toxicity, mobility, or volume through treatment addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

5. Short term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost includes estimated capital and Operation Maintenance (O&M) costs, as well as present-worth costs.

Modifying Criteria

The modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

8. State acceptance addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. Community acceptance addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS report.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can be found in Tables 9 and 11 of the FS.

The section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis. Only those alternatives which satisfied the first two threshold criteria were balanced and modified using the remaining seven criteria as compared to these NCP criteria.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative SC-1, No Action, would be the least protective of human health and the environment because it would offer no protection to human health and the environment. Because no remedial action would be performed, both chemical and radiological impacts exceeding site-specific cleanup levels and ARARs would remain at the Site. Therefore, potential future unacceptable exposure to human health and the environment would remain at the Site. As a result, this alternative would not meet the threshold criteria in the NCP – that an alternative would be protective of human health and the environment and meet ARARs.

Alternatives SC-2, Multi Barrier Cap/Excavation, and SC-3, Excavation and Off-Site Disposal, both provide overall protection of human health and the environment. Each of these alternatives would eliminate exposure to impacted source materials exceeding site-specific Cleanup levels. In addition, Alternatives SC-2 and SC-3 both include requirements for waterlines for adjacent residents to eliminate exposure to contaminated groundwater. Alternative SC-2, Multi Barrier Cap/Excavation, would remove all radiological, dioxin and PCB waste that exceeds cleanup requirements from the Site for off-site disposal while the remaining chemical waste material would be consolidated beneath a RCRA landfill cap which will prevent exposure to materials that present an unacceptable risk. This alternative also includes requirements for monitoring to ensure that exposure does not occur in the future. Alternative SC-3, Excavation and Off-Site Disposal, would eliminate exposure to impacted radiological, dioxin, PCB, and chemical source materials by removing them from the Site. Because this alternative removes all materials that create an unacceptable risk from the site, it provides the greatest degree of overall protection.

COMPLIANCE WITH ARARS

Alternative SC-1, No Action, would not comply with chemical-specific ARARs applicable to the Site.

Alternatives SC-2, Multi Barrier Cap/Excavation, and SC-3, Excavation and Off-Site Disposal, would meet all chemical, location, and action- specific ARARs. See Tables 1A-1I of the FS for additional identification and discussion of ARARs for each alternative.

LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative SC-1, No Action, does not provide any long-term effectiveness or permanence. Alternative SC-2, Multi-Barrier Cap/Excavation, would provide both long-term effectiveness and some permanence because landfill capping is a proven technology to eliminate exposure to chemical waste material effectively in the long-term. The cap would be regularly maintained to ensure that it remains effective in the long-term. In addition, because the radiological, PCB, and dioxin waste is excavated and disposed of off-site. This component of the alternative is also permanent and effective in the long-term.

Alternative SC-3, Excavation and Off-Site Disposal, provides the greatest degree of long-term effectiveness and permanence because both chemical and radiological source materials exceeding cleanup levels would be permanently removed from the site thereby ensuring that this remedy remains effective in the long-term.

In addition, Alternatives SC-2 and SC-3 both include requirements for waterlines for adjacent residents. This component of these Alternatives provides additional long-term effectiveness and permanence because the waterline permanently eliminates the risk to these adjacent residents from using contaminated water.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

None of the alternatives reduce toxicity, mobility, or volume through treatment (although some materials shipped off-site may require treatment prior to disposal).

However, Alternative SC-2, Multi Barrier Cap/Excavation, would reduce toxicity, mobility or volume although not through treatment. This alternative would reduce mobility of the chemical contaminants that are placed beneath the landfill cap at the Site by preventing water from coming into contact with waste material thereby preventing this contamination from mobilizing. The toxicity of the radiological, PCB, and dioxin waste material would be greatly reduced/eliminated because all of this material that exceeds cleanup levels will be removed from the site. In addition, because all soil and sediment above cleanup levels established for radiological, PCB, and dioxin waste material will be removed from the property, both the volume and mobility of this contamination is greatly reduced/eliminated although not through treatment.

Alternative SC-3, Excavation and Off-site Disposal, would reduce/eliminate toxicity by removing both the radiological, PCB and dioxin contamination as well as all chemical waste material from the Site, thereby greatly reducing/eliminating the toxicity of what remains at the

Site to acceptable levels. In addition, because all soil and sediment above cleanup levels will be removed from the property, both the volume and mobility of contamination is greatly reduced/eliminated although not through treatment.

SHORT-TERM EFFECTIVENESS

Because Alternative SC-1, No Action, would not require any activities to be conducted, there would not be any short-term impacts on the community and on-site workers.

Alternative SC-2, Multi-Barrier Cap/Excavation, would have some short-term impacts to the community from both the construction activities as well as from shipping materials off-site for disposal. However, these impacts can be greatly reduced by using standard construction techniques to reduce dust, etc. from the Site during excavation and construction of the cap. In addition, air monitoring will be conducted to ensure that adjacent residents are not adversely impacted while this Alternative is being implemented. Appropriate OSHA/health and safety requirements will be followed to reduce risk to on-site workers. Because this Alternative requires off-site disposal of radiological, PCB and dioxin waste as well as incoming shipments of material for construction of the cap, there will be a significant increase in truck traffic through the community during the 18-25 month time frame the FS estimates it will take to implement this remedy.

Alternative SC-3, Excavation and Off-site Disposal, would have slightly greater short-term effects because this Alternative would require all chemical and radiological waste material be excavated and shipped off-site for disposal. However, these impacts can be greatly reduced/eliminated by using standard construction techniques to reduce dust, etc. from waste material during the excavation and shipping phase. In addition, air monitoring will be conducted to ensure that adjacent residents are not adversely impacted while this Alternative is being implemented. Appropriate OSHA/health and safety requirements will be followed to reduce risk to on-site workers. Because this Alternative requires off-site disposal of both chemical and radiological waste, there will be a significant increase in truck traffic through the community during the 9-16 month time frame the FS estimates it will take to implement this remedy.

IMPLEMENTABILITY

Alternative SC-1 is the easiest to implement because no remedial actions are required.

Alternatives SC-2 and SC-3 are both easily implementable because they both involve reliable waste disposal technologies with proven histories of success. In addition, the personnel, equipment and materials required to implement each of these technologies are readily available. The greatest degree of variability in these alternatives is derived from the time frame required for implementation of these alternatives and the impact on the community. Alternative SC-3B will take less time to construct than Alternative SC-2B and will involve some additional truck traffic in comparison to Alternative SC-2B according to Table 9 of the FS.

COST

Alternative SC-1, No Action, would require the least cost. As shown in Table 8 of the FS, there are no costs associated with the No Action alternative.

Alternative SC-2, Multi-Barrier Cap/Excavation, is generally the second most expensive alternative, with cost estimates ranging from approximately $26,000,000 to $98,000,000 based upon the risk exposure scenario.

Alternative SC-2A Recreational Risk Scenario $26,057,000

Alternative SC-2B Adjacent Resident w/out Groundwater $28,106,000

Alternative SC-2C Adjacent Resident w/ Groundwater $94,514,000

Alternative SC-2D On-Site Resident $98,066,000

Alternative SC-3, Excavation and Off-Site Disposal, is generally the most expensive alternative, with estimated costs ranging from approximately $54,000,000 to $127,000,000 based on the risk exposure scenario.

Alternative SC-3A Recreational Risk Scenario $54,055,000

Alternative SC-3B Adjacent Resident w/out Groundwater $55,553,000[4]

Alternative SC-3C Adjacent Resident w/ Groundwater $120,888,000

Alternative SC-3D On-Site Resident $126,868,000

COMMUNITY ACCEPTANCE

From June 24th, 2004 to August 25th, 2004, EPA held a public comment period to seek input from the community regarding remedial cleanup alternatives evaluated for the Site. In addition, comments were received during a public hearing conducted August 4, 2004.

On the basis of comments received, there was overwhelming support in the community for the selected remedy SC-3B. In addition, while there was some support for Alternative SC-2B, it was significantly less than support shown for Alternative SC-3B. A summary of the comments received and EPA's response to comments is included in the Responsiveness Summary portion of this ROD (Part 3).

[4]the cost estimate for the selected remedy has been revised. More detail is provided in Section I.

STATE ACCEPTANCE

The Commonwealth of Massachusetts has indicated its support for the selected remedy by providing its concurrence in the attached letter (Appendix A).

L. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The Selected Remedy is Alternative SC-3B. The selected remedy is a comprehensive remedy for the Site based upon EPA's determination that groundwater will not be addressed at this Site for the reasons outlined in Section D of this ROD. EPA has selected this remedy because it believes this cleanup plan is cost-effective yet still protective. The selected remedy achieves the best balance among the criteria used by EPA to evaluate alternatives. The selected remedy provides both short-term and long-term protection of human health and the environment, attains all Federal and State applicable or relevant and appropriate environmental requirements, reduces the volume and mobility of contaminated soil and sediment, utilizes permanent solutions to the maximum extent practicable, by removing contaminated material exceeding site cleanup levels off-site for disposal.

The vast majority of the comments received during the comment period requested that Alternative SC-3B be selected as the remedy for the Site based upon numerous concerns including regarding the long term effectiveness and permanence of the proposed alternative.

The selected remedy does not address Site groundwater. Section D. Scope and Role of Operable Unit or Response Action discussed this determination.

2. Description of Remedial Components

The selected remedy includes excavation and off-site disposal of material exceeding cleanup levels. This alternative eliminates the exposure pathways to soil and sediment.

A. The primary components of this alternative include:

- Coordination with local, state and federal agencies for excavating source area materials within a wetland and associated buffer zone;
- Preparation and implementation of a traffic control plan to adequately manage the increased volume of truck traffic associated with transportation of chemical and radiological impacted source material from the site;
- Preparation and implementation of a transportation and emergency spill contingency plan;
- Relocation of existing power line structures needed to implement the rest of the remedy in coordination with National Grid.

- Connecting two residences to public water.[5] The two residences are identified as Union Road House 1 and Union Road House 2 in the Remedial Investigation.

- Mobilization/demobilization of all personnel and equipment to the site for construction activities;

- Clearing and grubbing areas of the site requiring excavation;

- Establishing a survey grid to conduct sequential consolidation of grid cells to minimize generation of large quantities of groundwater with one open excavation;

- Based on the selected risk scenario for the site (Adjacent Resident without Groundwater Consumption), excavation and off-site disposal of soil and sediment exceeding radiological and chemical Cleanup levels including dioxin and PCBs as identified in Tables L-1 and L-3, estimated in the FS as approximately 34,445 yd^3;

- Excavation and off-site disposal of sediment from the Inner Rung and exceeding the cleanup levels listed in Table L-2, estimated by the FS to be approximately 1,111 yd^3 soil/sediment. The FS estimated this will take a period of one month;

- Dewatering of open areas as needed in each area of the Site needed to complete the rest of the remedial action;

- Transportation of all impacted soils via truck and rail to an approved offsite disposal facility;

- All excavated soil and sediments disposed of in accordance with TSCA and the TSCA determination included as part of this ROD;

- Placement of clean fill in open areas to backfill to grade and/or wetlands restoration/replication as appropriate;

- Vernal pools and spotted turtle habitat surveyed to focus on the spotted turtle and marbled salamander and evaluate the habitat for any other rare species or species of special concern that may be found on the Shpack Site;[6]

[5] Installation of the waterline shall comply with the substantiative requirements of the ARARs relating to protection of wetlands resources, including the Massachusetts Wetlands Protection Act. Design will include detailed plans of the waterline, elevations and inverts, all wetlands resources which may be impacted by the waterline extension, de-watering methods and the options for installing the waterline at the railroad crossing on Peckham Street, if necessary.

[6] The "Rare Animal Observation Forms" and "Vernal Pool Certification Forms" should be completed and submitted as part of the substantiative requirements relating to the Massachusetts Natural Heritage and Endangered Species Program (NHESP).

- Vernal pools and areas containing rare or species of special concern will be protected if possible or restored/replicated if impacted – an impact minimization and habitat restoration plan prepared and followed in conjunction with this work;

- All work in wetlands areas conducted in accordance with the Wetland Determination included in this ROD. In addition, work in wetlands, including replication and restoration, must comply with the Wetlands Protection Act Regulations, 310 CMR 10 as well as all other ARARs identified for this component of the remedy. [7]

- Installation of a temporary chainlink fence surrounding the entire site, with access gates to secure the site during the design and construction phases of the cleanup;[8]

- Preparation and implementation of a surface water, sediment and groundwater monitoring program, including installation of additional wells around the perimeter of the Site;[9]

- Performance of 5-year reviews to monitor effectiveness of the remedy;[10]

- Implementation of institutional controls to restrict future use of property and groundwater.[11]

The selected remedy may change somewhat as a result of the remedial design and construction processes. Changes to the remedy described in this Record of Decision will be documented by the EPA Remedial Project Manager in a technical memorandum added to the Administrative Record

[7] The wetland replication/restoration must include at a minimum, detailed plans illustrating all existing and proposed contour elevations; soil profiles for imported soils, a construction schedule; a planting plan including the number, size, and species of all plants; groundwater elevations; description of the replicated wetland function and values; physical features that replicate the vernal pool habitat and rare species habitat functions of the existing wetlands including coarse woody debris, snags and pit and mound topography; and a 5 year monitoring plan. The wetland replication/restoration plan should commence in the first growing season after the construction activity has been completed. The Conservation Commissions of Norton and Attleboro will be given a reasonable opportunity to review and comment on deliverables relative to wetlands restoration/replication

[8] After construction is completed the community members, municipalities, landowners, and other stakeholders will be consulted to determine the fence should be permanent or removed as part of demobilization.

[9] The selected remedy includes a long-term monitoring program to include sampling and analysis of data to ensure that the remedy continues to be effective. This will include sediment and surface water sampling of wetlands near the site ensure that re-contamination is not occurring.

[10] EPA will review the Site at least once every five years after the initiation of remedial action at the Site to assure that the remedial action continues to protect human health and the environment. If additional action is required to ensure protectiveness, it will be taken.

[11] Restrictions would be placed on the Site to prevent residential use or other uses that present unacceptable risk in the future. Groundwater restrictions would also be necessary on the site and for Union Road House 1 and Union Road House 2 in the form of deed restrictions. These restrictions will be enforced by the appropriate government entity.

for the Site, an Explanation of Significant Differences or a Record of Decision Amendment, as appropriate.

B. Pre-design and Design Studies

Pre-design studies sufficient to design the selected remedy will include, but not be limited to, the following:

Performance of pre-design and design studies to prepare for the relocation of existing power line structures needed to implement the rest of the remedy in coordination with National Grid.

Site specific sediment toxicity testing will be conducted during pre-design efforts to ensure that the selected cleanup standards are protective of the benthic invertebrate community. As part of remedial design, toxicity testing will be conducted in Chartley Swamp and the onsite seasonal wetlands to confirm that the selected sediment cleanup levels in Tables L-2 and L-3 are protective of the benthic community. Toxicity testing will consist of collecting bulk sediment samples for use in ten day chironomid toxicity tests to assess the impact of contaminated sediment on growth and survival. Three sampling locations will be selected for each of the exposure areas (i.e. Chartley Swamp and the onsite seasonal wetlands), two in an area near where COC concentrations are the highest (near the Tongue Area in Chartley Swamp), and one to represent an area with lower COC concentrations so as to provide a gradient across which potential effects can be observed and to provide information useful for targeting potential remediation areas.

Sediment sampling will be performed in the inner rung of Chartley Swamp as necessary to more fully delineate the extent of sediment exceeding cleanup levels in Table L-2.

An assessment of ecological risk posed by soil in the Combined Field and Shrubland habitat (shown in Figure 4) of the site will be performed utilizing food chain models developed to evaluate receptor risk from soil in other areas of the site following "Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments (EPA 540-R-97-006)".

A design study will be prepared to determine options for limiting the impact of dewatering on wetlands.

TABLE L-1 SOIL CLEANUP LEVELS, SHPACK SITE

Contaminant	Cleanup Level	Rationale
Dioxin (TEQ)	1.0 ppb*	EPA Directive 9200.4-26*
Radium 226	3.1 pCi/gm	10-5 excess cancer risk
Uranium 234	220 pCi/gm	"
Uranium 235	52 pCi/gm	"
Uranium 238	110 pCi/gm	"
Arsenic	12 ppm	"
Benzo(a)anthracene	28 ppm	"
Benzo(a)pyrene	2.8 ppm	"
Benzo(b)fluoranthene	28 ppm	"
Dibenz(a,h)anthracene	2.8 ppm	"
Lead	1400 ppm	Blood Level Modelling for an Adult Exposure
Nickel	7000 ppm	HI= 1
Total Uranium	1100 ppm	HI = 1

*In accordance with the April 13th, 1998 OSWER Directive 9200.4-26, "one ppb is to be generally used as a starting point for setting cleanup levels for setting cleanup levels for CERCLA removal sites and as a cleanup level for remedial sites for dioxin in surface soil involving a residential exposure. The "adjacent resident, w/o groundwater exposure" scenario on which the remedy is based assumes approximately 150 days of exposure to site soils, which is essentially equivalent to an on-site exposure. Therefore, the cleanup goal for dioxin protective of human health is being set at 1 ppb TEQ.

Table L-2: Cleanup Levels, Inner Rung, Chartley Swamp

Contaminant of Concern	Cleanup Level (mg/kg)	Basis
Arsenic	8.4	Food Chain model, LOED
Cadmium	6.2	"
Copper	41	"
Chromium	2,769	Food Chain, LOAEL
Lead	32	Food Chain model, LOED
Mercury	0.89	"
Silver	0.89	"
Beryllium	45	Food Chain Model, NOAEL
Zinc	1591	Food Chain Model, LOAEL

Table L-3: Cleanup Levels, Sediments in the On-Site Seasonal Wetlands

Contaminant of Concern	Cleanup Level (mg/kg)	Basis
Benzo(a)anthracene	1.2	Food Chain Model (LOAEL)
Benzo(a)pyrene	1.3	"
Benzo(b)fluoranthene	1.3	"
Benzo(k)fluoranthene	1.3	"
Chrysene	1.3	"
Dibenz(a,h)anthracene	1.3	"
Indeno(1,2,3)pyrene	1.3	"
Aroclor (1254)	0.27	"
Arsenic	188	"
Barium	853	Food Chain Model, NOAEL
Vanadium	448	Food Chain Model. LOAEL.
DDT	0.027	"
Antimony	39	"
Beryllium	5	Food Chain Model, NOAEL
Cadmium	103	Food Chain Model, LOAEL
Chromium	427	"
Copper	122	"
Lead	551	"
Mercury	0.26	"
Nickel	7943	"
Silver	187	Food Chain Model. NOAEL.
Zinc	437	Food Chain Model. LOAEL

3. Summary of the Estimated Remedy Costs

All cost information reported in the ROD are estimates from the Feasibility Study, with an accuracy expectation of +50 to -30%. These estimates will be refined as the remedy is designed and implemented. The original estimated cost of the Selected Remedy (SC-3B) as outlined in Table 12B of the Feasibility Study is $55,553,000.

EPA gathered additional information that indicates that the transportation and disposal of material exceeding cleanup standards is considerably lower than the cost figures used in the FS. As a result, EPA has revised the estimated cost of the selected remedy to $43,034,000. See memorandum dated September 24, 2004 from Ed Conroy of Metcalf and Eddy to David Lederer, Remedial Project Manager entitled "Shpack-T&D Costs" in the Administrative Record for more information.

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

The Feasibility Study estimated the time for construction of SC-3B at 9-16 months.

4. Expected Outcomes of the Selected Remedy

The selected remedy is based upon a future exposure scenario that envisions a resident that lives next to the site (adjacent resident) who is connected to a public water supply and therefore does not use site groundwater for drinking water, etc. The selected remedy does not address groundwater. Section D. *Scope and Role of operable unit or Response Action* of this Decision Summary discussed this determination. The expected outcome of the selected remedy is that the Shpack Landfill Superfund Site will no longer present an unacceptable risk to adjacent residents via exposure to contaminated soil and sediment and will be suitable for passive recreational use. Approximately 9-16 months are estimated as the amount of time necessary to achieve the cleanup levels for the selected remedy.

The selected remedy will also provide environmental and ecological benefits such as restoration of sensitive ecosystems, protection of endangered species, protection of wildlife, and wetlands restoration.

a. Cleanup Levels

1. Soil and Sediment Cleanup Levels

The anticipated future use of the site is based upon an adjacent resident that does not consume groundwater. The site is also suitable for passive recreation. The site will not be suitable for residential use or the use of groundwater as a drinking water.

Soil cleanup levels for compounds of concern in surface and subsurface soil exhibiting an unacceptable cancer risk and/or hazard index have been have been established such that they are protective of human health. For the selected remedy, soil cleanup levels for known and suspect carcinogenic chemicals of concern (Classes A, B, and C compounds) have been set at a 10-5 excess cancer risk level considering exposures via dermal contact and incidental ingestion.

Cleanup levels for chemicals of concern in soils having non-carcinogenic effects (Classes D and E compounds) were derived for the same exposure pathway(s) and correspond to an acceptable exposure level to which the human population (including sensitive subgroups) may be exposed without adverse affect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (hazard quotient = 1).

The cleanup values that were selected for the adjacent resident without consumption of groundwater (the selected remedy) are listed in Table L-1. Table L-1 summarizes the cleanup levels for carcinogenic and non-carcinogenic chemicals of concern in soils protective of direct contact with soils.

Cleanup levels based on protection of environmental receptors are as stated in Tables L-2 and L-3 for the Chartley Swamp and the Interior Wetlands.

These sediment cleanup levels must be met at the completion of the remedial action throughout the Site. They are consistent with ARARs for sediment, attain EPA's risk management goals for remedial action, and are protective of environmental receptors.

Site specific toxicity testing will be conducted during pre-design efforts to ensure that the selected cleanup standards are protective of the benthic invertebrate community. As part of remedial design, toxicity testing will be conducted in Chartley Swamp and the onsite seasonal wetlands to confirm that the selected sediment cleanup levels are protective of the benthic community. Toxicity testing will consist of collecting bulk sediment samples for use in ten day chironomid toxicity tests to assess the impact of contaminated sediment on growth and survival. Three sampling locations will be selected for each of the exposure areas (i.e. Chartley Swamp and the onsite seasonal wetlands), two in an area near where COC concentrations are the highest (near the Tongue Area in Chartley Swamp), and one to represent an area with lower COC concentrations so as to provide a gradient across which potential effects can be observed and to provide information useful for targeting potential remediation areas.

M. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Shpack Landfill Superfund Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply with ARARs and is cost effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element.

1. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will adequately protect human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through engineering controls and institutional controls. More specifically, the excavation and off-site disposal of all materials exceeding site cleanup levels will eliminate exposure to these contaminants.

The selected remedy will reduce potential human health risk levels such that they do not exceed EPA's acceptable risk range of 10^{-4} to 10^{-6} for incremental carcinogenic risk and such that the non-carcinogenic hazard is below a level of concern, in this case the Hazard Index will not exceed 1. It will reduce potential human health risk levels to protective ARARs levels, i.e., the remedy will comply with ARARs and To Be Considered criteria. In addition, site sediments will be addressed such that they no longer present an unacceptable risk to ecological receptors. Implementation of the selected remedy will not pose any unacceptable short-term risks or cause any cross-media impacts.

2. The Selected Remedy Complies With ARARs

The selected remedy will comply with all federal and any more stringent state ARARs that pertain to the Site. In particular, this remedy will comply with the federal and state ARARs identified in Table 1G of the FS (for Alternative SC-3B; attached to this ROD).

3. The Selected Remedy is Cost-Effective

In EPA's judgment, the selected remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria -- long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

From this evaluation, EPA has determined that Alternative SC-3 is cost effective as it meets both threshold criteria and is reasonable given the relationship between the overall effectiveness afforded by the other alternative and cost compared to other available options. In evaluating the differences between Alternatives SC-2B and SC-3B, the decisive factors were that Alternative SC-3B provides the greatest long-term effectiveness and permanence when compared to the other source control alternative, SC-2B, and also provides greater reduction in toxicity, mobility, and volume, although not through treatment.

Although the difference in cost between these two Alternatives is large, EPA believes the additional cost is justified given the uniqueness of the waste material and the risks it presents to the community. EPA also believes that the cost differential between Alternatives SC-2B and SC-3B for the chemical waste component of these alternatives may well end up being significantly smaller than estimated in this ROD. This is based upon EPA's intention to phase the work at the Site with the radiological waste being addressed first. Because the different types of contamination present at the site may be co-located, the amount of non-radiological waste that may be left to be disposed of off-site may be, in fact, less than what is estimated in the FS. As a result, the cost differential between the 2 alternatives in practice may be smaller than depicted in the FS.

Finally, while Alternative SC-2 has marginally fewer short term impacts than Alternative SC-3 on the community, the difference is not significant given that these types of impacts are typical during cleanup operations and can be minimized or eliminated through routine, standard operating procedures.

Given the importance to the community that the remedy selected have the greatest overall effectiveness, the additional cost associated with SC-3 is justified.

4. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In this case because of the nature of the material at the Site, essentially municipal and industrial waste combined with PCBs, dioxin and radioactive materials, EPA determined that it was impractical from a technical standpoint to utilize treatment to address this diverse waste material. As a result, neither alternative relied upon alternative treatment technologies or resource recovery.

The selected remedy provides the greatest long-term effectiveness and permanence by disposing of all chemical, radioactive, dioxin and PCB material off- site. The selected remedy also provides the greatest reduction in toxicity, mobility, and volume although not through treatment. The selected remedy would reduce/eliminate mobility of chemical, radiological, PCB, and dioxin waste material because all of the material that exceeds cleanup levels will be removed from the Site. The toxicity of the chemical, radiological, PCB, and dioxin waste material would be greatly reduced/eliminated because all of the material that exceeds cleanup levels will be removed from the Site. In addition,

because all soil and sediment above cleanup levels established for chemical, radiological, PCB, and dioxin waste material will be removed from the site, the volume of this contamination is greatly reduced/eliminated, although not through treatment. The selected remedy has acceptable short term impacts to the community and workers that can be minimized or eliminated through routine, standard operating procedures. The selected remedy is easily implementable and the cost is reasonable given the overall effectiveness of this remedy. The selected remedy also has significant support from the community and the Commonwealth of Massachusetts. Alternative SC-2B, on the other hand, was actively opposed by most in the community that provided input on remedy selection. This leads to the conclusion that the selected remedy provides the best balance of trade-offs among the alternatives.

5. The Selected Remedy Does Not Satisfy the Preference for Treatment as a Principal Element

The selected remedy does not satisfy the statutory preference for treatment as a principal element. In this case because of the nature of the material at the Site, essentially municipal and industrial waste combined with PCBs, dioxin and radionuclides, EPA determined that it was impractical from a technical standpoint to utilize treatment to address this diverse waste material.

6. Five-Year Reviews of the Selected Remedy are Required.

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

N. DOCUMENTATION OF SIGNIFICANT CHANGES

EPA presented a proposed plan that provided for off-site disposal and consolidation with capping for remediation of the Site on June 23, 2004. This preferred alternative included off-site disposal of PCB, dioxin and radioactive waste, consolidation and capping of remaining waste material and construction of a water line. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that Alternative SC-3B would be selected in this Record of Decision, as opposed to SC-2B as originally identified in the proposed plan.

O. STATE ROLE

The Massachusetts Department of Environmental Protection has reviewed the various alternatives and has indicated its support for the selected remedy. The State has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations. The MA DEP concurs with the selected remedy for the Shpack Landfill Superfund Site. A copy of the declaration of concurrence is attached as Appendix A.

PART 3

RESPONSIVENESS SUMMARY

TABLE OF CONTENTS

SHPACK LANDFILL SUPERFUND SITE RESPONSIVENESS SUMMARY

PREFACE

The U.S. Environmental Protection Agency (EPA) held a 30-day public comment period from June 24th to August 25th, 2004, to provide an opportunity for public input on the June 2004 Proposed Plan to address contamination at the Shpack Landfill Superfund Site (the "Site") in Norton/Attleboro, MA. EPA prepared the Proposed Plan based on the results of the human-health risk assessment, ecological risk assessment, remedial investigation data evaluation reports, and the Commonwealth of Massachusetts groundwater use and value determination. All documents that were used in EPA's selection of the preferred alternative were placed in the Administrative Record which is available for public review in Norton Public Library, and at the EPA Records Center in Boston, Massachusetts.

The purpose of this Responsiveness Summary is to document EPA's responses to the questions and comments raised during the public comment period. EPA considered all the comments summarized in this document before selecting a final remedy for the Shpack Landfill Superfund Site

This Responsiveness Summary is organized into the following sections:

A.Overview of Proposed Plan. This section briefly outlines the plan proposed to the public in June 2004 for addressing the contamination at the site.

B.Site history and background on community involvement and concerns. This section provides a brief history of the site and an overview of community interests and concerns regarding the site.

C.Summary of comments received during the public comment period. This section summarizes and provides EPA's responses to the oral and written comments received from the public during the public comment period.

A copy of the transcript from the public hearing held on Thursday, August 4, 2004, in Norton, Massachusetts, is included as Attachment A to this Responsiveness Summary. The written comments received during the comment period are included in Attachment B.

A. OVERVIEW OF PROPOSED PLAN

On June 23rd, 2004, the Proposed Plan for the Shpack Landfill Superfund Site was released. Its main points included:

•Clean up based upon a future scenario in which a resident living next to the Site (adjacent resident) is connected to a public water supply and does not drink the groundwater at the site

•The public waterline will be extended to include two residences adjacent to the landfill that are currently on private wells.

- **Approximately 10,500 cubic yards of soil containing radiological contaminants of concern above the cleanup levels will be excavated and disposed of off-site.**
- **Approximately 2250 cubic yards of dioxin and PCB-contaminated sediment will be excavated and disposed of off-site.**
- **Contaminated sediments in wetland areas of the site will be consolidated to an upland area on-site and the disturbed wetlands will be restored and/or replicated.**
- **The upland area will be capped to prevent exposure to contaminated waste.**
- **The site will be fenced to control access and institutional controls will be put in place to ensure the remedy remains protective in the long term.**
- **Groundwater will continue to be monitored and the cap maintained in the long term.**

•Based on the presence of ALI Landfill and other technical issues, the proposed plan did not address groundwater contamination at and near the site. It addressed the risk of exposure to contaminated groundwater by installing a public waterline to the two homes adjacent to the site that are currently on private wells.

B. SITE HISTORY AND BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Site History

Between 1946 and the 1970's, the Shpack Site received domestic and industrial wastes, including low-level radioactive waste. The filled areas where the wastes were dumped are overgrown and entirely enclosed by a chain link fence. The Site itself is relatively flat with vegetated minor depressions and knolls and was formerly a flat wetlands area. A powerline transmission corridor divides the Site into two portions. The Site is bounded on two other sides by the Chartley Swamp that drains under Union Road to Chartley Pond. There are two homes on private drinking water wells within 500 feet of the Site.

In 1980, the Shpack Site was added to the Department of Energy's (DOE) Formerly Utilized Remedial Action Program (FUSRAP), which dealt with the legacy of the nation's early atomic energy programs. The uranium at the site is thought to have originated from local businesses that constructed reactor cores for the early naval propulsion program from the early 1950's until the mid-sixties.

A more detailed description of the Site History can be found in Section 1.2.2 of the RI Report.

In 1978, a concerned citizen who had detected elevated radiation levels at the site contacted the Nuclear Regulatory Commission (NRC). The NRC conducted an investigation that confirmed the presence of radioactivity above background levels. The NRC determined that certain operations associated with government activities might have resulted in the deposition of radioactive materials within the Shpack Landfill. The primary constituents of concern found were radium and uranium. It is not known exactly when these radioactive materials were deposited at the site.

The NRC investigation concluded that the Shpack Landfill was a candidate for the FUSRAP program. On behalf of the NRC, Oak Ridge National Laboratory (ORNL) conducted a radiological survey in 1980 that identified metallic wastes containing uranium of various enrichments. The ORNL report confirmed the NRC preliminary findings and defined general areas of radiological contamination. In 1998, FUSRAP responsibility was transferred from DOE to the United States Army Corps of Engineers (USACE), and a gamma walkover survey was performed to further delineate the radiological contamination.

In October of 1981, a security fence was installed around the site on behalf of DOE to prevent unauthorized access. With the exception of the area located in the section of the site known as the Tongue Area and an approximately 1,000-foot section of replacement fence, this fence is the same fence that currently is located on the Site. Additional studies conducted by DOE between 1982 and 1984 identified chemical contamination (volatile organic compounds (VOCs) and metals) in groundwater. In 1984, EPA evaluated the site to determine if it should be listed on the National Priority List (NPL). The site was added to the list in June 1986.

A summary of preliminary investigations performed at the Site prior to 1990 is included in Table 1 of the RI. These investigations included sampling of various environmental media and primarily focused on evaluating radiological impacts at the Site.

In 1990, a group of potentially responsible parties formed the Shpack Steering Committee (SSC) and individual companies comprising the SSC entered into an Administrative Consent Order (ACO) with EPA (EPA Docket No. I-90-1113, June 24, 1990) which required them to conduct the Remedial Investigation/Feasibility Study (RI/FS) for the Site. In November 1991, the SSC prepared and submitted a Site Characterization Work Plan (SCWP) for the first phase of the RI, known as "Phase IA". Between 1991 and 1992, the SSC implemented Phase IA of the RI, which was a comprehensive investigation of potentially impacted media at the Site. The Phase IA identified chemical impacts in soil, groundwater, sediment and surface water at the site. Non-radioactive constituents of concern identified on Site during the Phase IA include:

- Volatile organic compounds (VOCs);
- Semi-volatile organic compounds (SVOCs);
- Polychlorinated biphenyls (PCBs);
- Pesticides;
- Dioxins/furans; and
- Inorganics.

The results of the Phase IA RI activities were documented in ERM's 1993 Initial Site Characterization (ISC) Report. In addition, the Phase IA contains a detailed summary of the previous investigations listed in Table 1 of the RI. With the exception of residential well monitoring activities, no chemical investigation activities were performed at the Site after the Phase IA ISC Report.

In 1999, the SSC in conjunction with EPA, the Corps of Engineers FUSRAP program, and DEP began preparation of work plans to implement Phase IB of the RI. The Phase IB activities included the following:

- Monitoring well Installation
- Groundwater sampling
- Surface water and sediment sampling
- Soil sampling
- Tar area delineation
- Well functionality and site survey
- Site fence extension
- Test pit excavation in Tongue Area
- Groundwater gauging
- Residential well sampling
- Surface water drainage characterization

The Phase 1B activities were completed in 2003. The Results of the Phase IB investigations, as well as the prior investigations are documented in the RI Report.

Community Involvement and Concerns

Throughout the Site's history, community concern and involvement has been high. EPA has kept the community and other interested parties apprized of Site activities through informational meetings, fact sheets, press releases, and public meetings. Below is a brief chronology of public outreach efforts.

•Local residents formed the Citizen's Advisory Shpack Team (CAST) to monitor Site activities. CAST has been actively involved in organizing community review of activities conducted at the Site and providing input to the various government agencies involved at the Site.

•On numerous occasions during 2000-2004, EPA and DEP held informational meetings at the Solmonese School in Norton, Massachusetts to update the community on the results of the Remedial Investigation and Feasibility Study.

•On November 20, 2003, EPA held an informational meeting in Norton, Massachusetts to discuss the results of the Remedial Investigation.

•On June 18, 2004, EPA published a notice of Proposed Plan in the Attleboro Sun Chronicle. The plan was made available to the public on June 24, 2004 at the Norton Public Library (June 25th) and the EPA office repository.

•The Proposed Plan contained a proposed determination with regard to offsite disposal of PCB-contaminated material pursuant to the Toxic Substances Control Act (TSCA). The Proposed Plan also contained a draft finding that there is no practical alternative to conducting work in the wetland areas of the Site under Section 404 of the Clean Water Act and Executive Order No. 11990. There were no proposed waivers of ARARs included in the Proposed Plan.

•On June 23, 2004, EPA held an informational meeting to discuss the results of the Remedial Investigation and the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan to a broader community audience than those that had previously been involved at the Site. At this meeting, representatives from EPA, MA DEP, and the US Army Corps of Engineers answered questions from the public.

•On June 24, 2004, EPA made the administrative record available for public review at EPA's offices in Boston and on June 25th at the Norton Public Library. This will be the primary information repository for local residents and will be kept up to date by EPA.

•From June 24, 2004, the Agency held a 30-day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. An extension to the public comment period was requested and as a result, the comment period was extended to August 25, 2004.

•On July 21, 2004, EPA published a notice of the extension of the comment period as well as a rescheduled public hearing date (August 4, 2004) in the Attleboro Sun Chronicle.

•On August 4, 2004, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the Responsiveness Summary, which is part of this Record of Decision.

C. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

This Responsiveness Summary addresses comments pertaining to the Proposed Plan that were received by EPA during the public comment period (June 24rd to August 25, 2004). Many individuals submitted written comments. Six individuals, including Congressman Barney Frank, and Norton Board of Selectman Chairman Bob Kimball submitted oral comments at the public hearing on August 4, 2004. What follows are EPA's responses to these comments. Where possible, EPA has grouped similar comments, and prepared a single response. A copy of the public hearing transcript is included as Attachment A. Copies of the written comments are included as Attachment B.

A. Comments in Support of Alternative SC-3B

1) The overwhelming majority of the comments supported selection of Alternative SC-3B over EPA's proposed Alternative SC-2B. In support of these comments, commenters pointed to a number of factors:

•Contamination should be taken off-site and not left on-site

•Long-term integrity of the cap under SC-2B is unsure. The permanence of SC-2B is in doubt over the long term.

•Volume and mobility reduction is superior under SC-3B versus SC-2B.

•Reliability of fencing and institutional controls will be poor in the long run. Trespassers will be able to access the site despite fencing and institutional controls. The powerline transmission right of way through the site presents difficult issues as well in terms of restricting access. Fencing restricts wildlife movement.

•Selection of SC-3B over SC-2B would allow reduction in monitoring and eliminate concern regarding trespassing thereby saving money.

•Mobility of contaminants has been underestimated by EPA. Removal under SC-3B will be more protective.

•Permanent elimination of contamination is the only complete way to address risk of harm from contaminants

RESPONSE TO COMMENT 1

After review of the comments received and taking into account the wishes of the community and the support of the Commonwealth of Massachusetts, EPA agrees that Alternative SC-3B should be the selected remedy for the Site. As outlined in the analysis of the nine selection criteria under CERCLA, SC-3B provides greater long term protection and permanence and also results in a greater reduction in volume mobility and toxicity by removing all material that presents an unacceptable risk from the site.

Although EPA uses institutional controls at sites to prevent exposure, EPA agrees that physical controls such as fencing are not as effective in the long term to restrict exposure in remote areas where trespassers are a concern, and are difficult to enforce at a site such as this. It should be noted that although the selected remedy will no longer require institutional controls to protect the integrity of the cap, it will still require institutional controls to restrict groundwater use and to make sure that residential housing is not permitted on the Site in the future. EPA believes these types of institutional controls are more easily enforced in the long-

term than in situations where trespassing is a concern. In addition, EPA agrees that selection of SC-3B over SC-2B will allow a reduction in monitoring at the Site and will eliminate concern regarding trespassing thereby providing some slight cost savings.

Although EPA agrees that it is appropriate to remove all waste from the Site in this instance, it should be noted that EPA has wide regulatory authority in fashioning remedial cleanup plans at Superfund sites under CERCLA. The definition of "remedial action" under CERCLA is broad and does allow for a variety of response actions including capping waste in place. In this particular case, given the unusual nature and variety of materials present at this Site, as well as State and community support, EPA agrees that removal of this waste material to an off-site location is an appropriate response action. (See also discussion of presumptive remedy for landfill discussion below)

2) In providing comments supporting selection of Alternative SC-3B over EPA's proposed Alternative SC-2B, a number of commenters expressed concern with the long-term operation and maintenance (O & M) costs associated with Alternative SC-2B as they relate to funding, oversight and long term protectiveness. Included in these comments were the following concerns:

•oversight of site O & M is impracticable over the long term under scenario SC-2B

•the Town of Norton and or the State could be responsible for O&M and other future costs in the long term because private Potentially Responsible Parties (PRPs) may not be viable in the future

•the Town of Norton should not bear financial burden for the cleanup

RESPONSE TO COMMENT #2

Cost estimates in the Feasibility Study and Proposed Plan for the SC-2 alternatives did include an estimate of operation and maintenance costs. Notwithstanding, by selecting Alternative SC-3B, concerns raised by commenters regarding O & M have been addressed. Because all waste material that presents an unacceptable risk will be excavated and disposed of off-site, only limited monitoring will be required in the long-term to ensure that the remedy remains protective. As a result, the cost of this long term obligation is, compared to this obligation in Alternative SC-2B, quite small.

3) Several comments were received suggesting that it was not appropriate to catagorize the Shpack site as a "landfill" as it was really an essentially illegal unregulated dump. In addition, commenters noted that the nature of material disposed of at the Shpack Site was not consistent with materials disposed of at other landfills.

RESPONSE TO COMMENT #3

After review of the comments presented and information regarding the nature and extent of the contamination at this Site, EPA agrees that this particular Site presents several unique characteristics that distinguish it from typical landfills or municipal landfills.

Typical landfills/municipal landfills do not contain radioactive waste. At this Site approximately one-third (1/3) of the material that the Feasibility Study estimated must be addressed is radiological in nature. In addition, because a large portion of the remaining chemical waste material is located in wetland areas, wetland requirements necessitate that this material also be excavated and moved (placed under a cap as in SC-2B or taken off-site as required in SC-3B). Municipal landfill closures typically do not require significant excavation and movement and removal of large quantities of waste material to occur throughout the landfill prior to putting the cap in place, as is the case here.[12] As a results, the major premise of landfill closure, that all or most waste will be covered in place, does not exist here because of these unique site specific factors.

In addition, this Site is relatively small in size and the amount of waste material that must be addressed is also relatively small and near the surface when compared to most landfills. One of the major reasons that waste is covered in place at municipal landfills is that the size of the landfill and the quantity of waste that needs to be addressed is so large that it is not cost effective or practicable to remove the waste. In addition, the waste requiring corrective action at typical landfills is often buried at great depth, below the ground surface, making removal of the waste impracticable.

This is simply not the case at Shpack where the cap area would extend 2 to 3 acres in size and the waste that needs to be addressed is approximately 34,000 cu yds (including radiological and non-radiological waste). Compared to other landfill closures in Region I, the estimated volume of the material required to be removed in the selected remedy is relatively small. In addition, the material requiring excavation under the selected remedy is, in general, close to the surface for the "adjacent resident without groundwater consumption" exposure scenario selected here. These factors make removal of the waste above cleanup levels practicable.

4) Comments were also received noting that the Attleboro Landfill (ALI) is not properly capped and the State has not enforced its regulations with regard to that site, and that Alternative SC-2B presents the same type of uncertainty. For this reason Alternative SC-3B is preferred because it avoids the issue of effectiveness of capping in the long term.

RESPONSE TO COMMENT #4

By selecting Alternative SC-3B, concerns raised by commenters regarding enforcement of capping requirements have been addressed. Because all waste material that presents an unacceptable risk will be excavated and disposed of off-site, capping of the Site will no longer

[12] Some landfill closures might require small limited "hot spot" removals but not excavation and removal of large portions of landfill material as is necessary here (1/3 of the waste material at Shpack.).

be required. As a result, there should not be any concern regarding EPA's ability to effectively oversee a capping remedy in the long term.

5) Several commenters also expressed concern that the proposed Alternative SC-2B did not take into account the community's desire that the Site be used for passive recreation in the future.

RESPONSE TO COMMENT #5

In evaluating alternatives for cleanup of this Site, EPA looked at four different exposure scenarios that could represent potential future uses of the Site:

- Recreational User
- Adjacent resident w/out groundwater exposure
- Adjacent resident w/ groundwater exposure
- On-site resident

Because each exposure scenario was based upon different assumptions regarding activities that would occur at the site in the future, the result was that different quantities of waste material were addressed under each scenario. As result, under the Recreational User scenario, the smallest amount of waste would be addressed. The On-site Resident required the most waste be addressed with the two Adjacent Resident scenarios requiring amounts in between these other two scenarios be addressed.

By proposing the "adjacent resident w/out groundwater exposure" scenario, EPA believed it was addressing the community's desire that the Site be safe in the future for passive recreational use because this scenario required more stringent cleanup levels be met than the "recreational user" scenario thereby ensuring that the Site was safe as well for passive recreational use.

Based upon the comments received, EPA now understands that what the community meant by expressing its preference for passive recreation was that not only would the Site be safe for these activities (EPA's view) but that also the physical nature of the cleanup activities not interfere with or present an impediment to passive recreational activities. Clearly based upon comments received, constructing a cap would require some restrictions on recreational activities that would not be acceptable to many in the community. Because EPA has selected Alternative SC-3B, the remedy will no longer present a physical impediment to the types of passive recreation envisioned by many in the community.

6.) Commenters also expressed concern that installation of the water line will increase the development of land surrounding the Site thereby exposing an increased population to risks from the Site should Alternative SC-2B be selected

RESPONSE TO COMMENT #6

By selecting Alternative SC-3B, EPA has addressed this concern. All waste material that presents an unacceptable risk will be excavated and disposed of off-site. As a result, there should not be any concern that an increased population will be a risk in the future from the Site.

EPA notes, however, that both Alternatives SC-2B and SC-3B were based upon future use scenarios that envisioned residents living next to the site and that also visit the site periodically. As a result, EPA believes it has taken into account in scoping out both of these Alternatives the types of exposure likely to occur to people who live near the Site. That being said, regardless of how many people ultimately live near the site, EPA believes that either alternative would be protective of human health.

7) One comment was received that questioned whether Alternative SC-2B would be protective should an earthquake occur.

RESPONSE TO COMMENT #7

The likelihood of a seismic event large enough to adversely impact a properly designed landfill cover is considered remote, and in that unlikely occurrence, repairs could be made. In any case, Alternative SC-3B has been selected.

8) One comment was received stating that Alternative SC-2B did not take into account the effect future releases on drinking water that might be used by communities from a proposed water treatment plant on the Taunton River. Alternative SC-3B does address this concern.

RESPONSE TO COMMENT #8

No impact has been noted within Charley Pond, the closest open water body to the Site. In addition, given the large number of stream miles to the location in question, it is very unlikely any measurable impact could be detected at this proposed water treatment plant. .

9) Comments were also received from parties concerned with the number of cases of cancer in the community and, as a result, the commenters believe Alternative SC-3B is the best alternative because it removes contamination from the community.

RESPONSE TO COMMENT #9

The RI document focused on current and future exposures and risks. The selected remedy is protective of the community now and in the future.

10) Commenters also expressed their belief that Alternative SC-3B is cost effective.

RESPONSE TO COMMENT #10

In selecting Alternative SC-3B, EPA agrees that the remedy is cost effective.

11) One comment was received that stressed that the concerns of Norton residents were more important than the concerns of Attleboro and other communities.

RESPONSE TO COMMENT #11

Under the Superfund law, EPA is required to take into account the wishes of the community in making decisions regarding how to clean up Superfund sites. In this case, EPA has received comments from various parties including residents or representatives of both communities and has taken all comments into account in reaching its decision regarding cleanup of the Site.

B. Conduct of the work

1) One commenter asked that completion of ALI capping and the work at Shpack be coordinated.

RESPONSE TO COMMENT #1 – ALI and the Shpack Landfill are being addressed by different government entities and under different environmental laws. The cleanup at ALI is being overseen by Massachusetts DEP under state law while the cleanup at Shpack is being overseen by EPA under the federal Superfund law. However, to the extent there are opportunities to coordinate activities as the clean up occurs, EPA will attempt to coordinate with appropriate State officials.

2.) Other comments were received asking that EPA coordinate with the local public safety officials regarding truck routes. A related comment suggested that rail transport should be arranged if possible to minimize impacts/risks to vehicular traffic.

RESPONSE TO COMMENT #2 EPA will work closely with the affected communities regarding short term impacts from the ongoing cleanup to ensure that impacts are minimized or eliminated and concerns addressed to the extent possible. As part of the remedial design, rail transport will be evaluated to see if it is a feasible alternative to transport of waste material by truck.

3) One commenter suggested that there would be significant costs savings if the waterline was extended from Attleboro rather than from Norton.

RESPONSE TO COMMENT #3 – As part of the remedial design process, location of the waterline will be reviewed and options regarding location of the waterline evaluated.

4) A number of comments were received that addressed habitat and wetlands issues during the course of construction. These comments included the following:

•Rare Habitat, rare species, vernal pools and wetlands resources should be protected/impacts to these resources should be minimized during construction activities and these resources should be restored and/or replicated if impacted.

•Options for dewatering wetlands and a transportation and emergency spill contingency plan should be included in the ROD.

RESPONSE TO COMMENT #4

In response to these comments, additional requirements have been included in the description of the selected remedy to better address the protection of rare habitats, rare species, vernal pools and wetlands resources during the construction of the remedy. In addition, more detail has been added to the selected remedy regarding appropriate restoration and replication in these areas of special concern.

5) In addition, the Norton Conservation Commission has requested that certain activities obtain permits for work conducted in areas of the Site over which it has jurisdiction. The State National Heritage & Endangered Species Program (NHESP) has also requested plans be submitted to it for approval.

RESPONSE TO COMMENT #5

CERCLA Section 121(e)(1) reads :

"No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with this section"

Onsite, under the Superfund law, is defined as: "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action."

Because the work being conducted at the site is entirely onsite for purposes of the Superfund law, the permitting and approval requirements noted by the Conservation Commission and NHESP, do not apply. As a result, permits will not be applied for and documents and plans will not be forwarded for the purposes of obtaining formal approval.. However, EPA will provide the Conservation Commission and NHESP the information normally requested by their respective programs and provide them with a reasonable opportunity to review and comment regarding appropriate activities as cleanup work occurs at the Site.

6) Comments were also received requesting that Rare Animal Observation Forms and Vernal Pool Certification Forms be submitted

RESPONSE TO COMMENT #6

The substantiative requirements of the state and local wetlands protection programs, as well as those operated by the Massachusetts NHESP will be met during the course of the cleanup. The information required by these forms will be collected and the substantiative requirements of appropriate programs will be met.

7) The Board of Health stated that it may require specific monitoring during cleanup operations.

RESPONSE TO COMMENT #7 -- EPA is not required to seek formal approval or permits when conducting work on-site under the Superfund statue. However EPA will, of course, work closely with the Board of Health to address their concerns during the construction phase of the remedy and meet the substantiative requirements of the regulatory requirements normally imposed by the Board of Health.

8) The Board of Health also expressed concern that local roads could not support truck operations.

RESPONSE TO COMMENT #8

One of the items to be considered during the remedial design will be the coordination of truck hauling routes with local officials to ensure that truck operations are operated in a safe manner. One of the issues to be considered is the routes taken to the disposal site.

9.) One comment was received asking how residents would be protected during removal of contaminated soil.

RESPONSE TO COMMENT #9

Standard dust suppression techniques which have been shown to be highly effective will be used during soil excavation. These could include, but are not limited to, frequent watering down of areas in which work is being accomplished, the use of foam suppressants, and limiting the size of the open face of excavation at any one time. In addition, air monitoring both at the work site and the perimeter will be conducted during construction activities to ensure that the work is conducted safely. Finally, trucks leaving the "hot zone" of contamination will be decontaminated before they are allowed to leave the contamination reduction zone and the site itself.

10.) One comment was received asking for clarification of the safety of the water supply around the site. In a related comment, requests were received for the remedy to include waterline hookups for 2 properties in Attleboro on Peckham street.

RESPONSE TO COMMENT #10

Water levels in monitoring wells screened in the shallow zone at the Shpack site suggest that groundwater flow is semi-radially outward toward the northwest, north, northeast, east, and

southeast. The only direction in which water levels are higher immediately off the site is to the southwest, beneath the ALI Landfill. Although the groundwater contours for the shallow zone suggest that flow would be toward the private water supply wells north of the site at Union Road House 1 and Union Road House 2, the shallow groundwater flow is apparently predominantly downward at the site, into the deeper overburden. This concept is supported by both water level and water quality measurements.

The positions of these two homes relative to the site (in particular their close proximity to the site) and to highly contaminated wells make them potentially vulnerable to future contamination if hydrologic conditions change (e.g., water levels in nearby ponds and wetlands change, drainage characteristics at the Shpack or ALI sites are altered). Therefore, EPA has determined that a sufficient threat exists at the Site to support installion of a waterline to these two houses. This determination is consistent with EPA's 1988 "Guidance Document for Providing Alternate Water Supplies":

"In addition, remedial action may be taken based on the threat of future contamination in cases where these criteria are not yet exceeded ("MCLs"). If potable wells are not currently contaminated, it must be determined they will be threatened with contamination before a final remedy addressing ground water contamination can be implemented."

While sampling has detected MTBE and arsenic in residential drinking water wells in Attleboro on Peckham Street, EPA does not believed that these detections are related to the Shpack Site. Because the contamination in these wells is not related to the Shpack Site, EPA cannot address waterline hookups for these properties as part of this cleanup action.

11.) One comment was received from the Norton Police Department expressing concern that they would be required to patrol and have a security presence at the Site.

RESPONSE TO COMMENT #11

During the construction of the selected remedy, requirements will be put in place to ensure that the Site is secure and that traffic flow is consistent with public safety concerns. The project design will include planning with municipal officials regarding public safety concerns, including traffic concerns, and especially routes of trucks and other vehicles on public roads.

C. Comments in Support of Alternative SC-2B

Although the overwhelming number of comments supported selection of Alternative SC-3B, some comments were received in support of Alternative SC-2B.

1.) One commenter noted that landfills are typically capped in accordance with the presumptive landfill guidance. In a related comment, it was noted that EPA has effectively capped sites like this one in the past.

RESPONSE TO COMMENT #1 --EPA's initial thought when scoping out general response actions at the Site was that this Site might be an appropriate candidate for EPA's presumptive remedy guidance for municipal landfills. Numerous comments were received from members of the community objecting to this characterization of the Site. After a review of these comments as well as revisiting the nature and extent of contamination at the Site, EPA agrees with those commenters who believe that this is not an appropriate site to use EPA's presumptive remedy guidance.

The Shpack property has always been a privately owned and operated. The Shpack Site is also relatively small in nature 9.4 acres total in size. In addition, the nature of the waste found at the Site is unique in that it includes large quantities of radioactive waste, as well as smaller quantities of PCBs and dioxin in addition to chemical wastes. All alternatives evaluated in the Proposed Plan involved excavation and off-site disposal of radiological material. In addition, both the dioxin and PCB waste are required to be excavated under all alternatives except the no action alternative. These contaminants are located through out the site, not just limited to small discrete "hot spots", although some "hot spots" are present. Significant amounts of contamination are also present in wetland areas of the site and must be excavated under any cleanup scenario consistent with wetlands requirements. As a result, significant excavation and movement of contaminated soil throughout the Site will be necessary to excavate waste that exceeds cleanup levels for these contaminants. In addition, much of the material exceeding cleanup levels is located near the ground surface and can be excavated and removed from the site; whereas in typical much large municipal landfill sites, the depth and volumes of contaminants make such an effort impracticable. These factors, particularly when viewed together, clearly indicate that this Site is uniquely different from most municipal landfills. Given these factors, EPA has decided that the presumptive remedy guidance is not appropriate for use at this Site.

2.) Another commenter noted that SC-2B is preferable because of the hazards of transportation of waste off-site, and excavation hazards due to air borne contamination. In a related comment, concerns were raised regarding short term effects from Alternative SC-3C citing the increase in truck traffic etc. that would result from this cleanup plan.

RESPONSE TO COMMENT #2

While it is true that the selected remedy will require greater quantities of waste material be excavated and transported thru the community, EPA believes that the additional risks posed by these activities can be effectively addressed by proper air monitoring, dust suppression and health and safety requirements. Trucks leaving the site will be decontaminated. Excavation and off-site transportation of wastes have been safely conducted at numerous sites and measures to address associated impacts are routine in the waste disposal arena.

In addition, EPA believes this commenter has over estimated the short term impacts to the community from hauling off-site the estimated additional 24,000 cubic yards of material required to be shipped off-site under Alternative SC-3B. First, both Alternatives SC-2B and SC-3B require all radiological waste to travel thru the community for off-site disposal

(approximately 12,000 cubic yards). While EPA agrees that Alternative SC-3B will have greater transportation needs than Alternative SC-2B, the magnitude of the impact on the community is not overwhelming. For example, assuming the commenter is correct that Alternative SC-3B would require 4,000 additional truck trips, these trips would be spread out over the several months estimated to complete Alternative SC-3B .[13] Also as discussed previously, part of remedial design will evaluate the use of rail transportation to remove contamination from the area to decrease the number of trucks using roads to carry the material. This could greatly impact the number of truck trips. Finally, although the Town of Norton and local residents expressed some concern regarding coordination regarding truck traffic there was little concern shown by the community regarding other short term impacts that would be borne by the community.

3) One comment was received supporting Alternative SC-2B because the commenter was concerned that shipping waste off-site would basically just be moving the problems at Shpack to a different location and the commenter concluded that the risks associated with this do not justify the result.

RESPONSE TO COMMENT #3

Although it is true that off-site disposal does, in some way move the problem from one location to another, the ultimate disposal location for this waste material is to a location engineered, designed and constructed to dispose of this material safely in the long term and regulated under the appropriate set of environmental laws and regulations. Any potential exposure that might occur during excavation and transportation can be addressed through proper engineering and safety practices. In addition, waste that is shipped off-site for disposal is required to meet stringent requirements for the transport of the material as appropriate.

4) One comment was received supporting Alternative SC-2B noting it will be protective of human health and the environment, most reliable from an implementation standpoint, has the fewest short term impacts and can be conducted in the shortest period of time.

RESPONSE TO COMMENT #4

EPA agrees that Alternative SC-2B is protective of human health and the environment. However, EPA does not agree that there are significant differences between Alternatives SC-2B and SC-3B in terms of implementability, short term impacts and construction time. EPA has conducted many excavation clean ups of this magnitude. Excavation does not involve complicated or innovated technologies. Regardless of whether Alternative SC-2B or SC-3B is selected, significant excavation would be required as both alternatives require excavation of the radiological, PCB and dioxin contaminated material from the Site, approximately 1/3 of the waste material which must be addressed. In addition, Alternative SC-2B requires moving

[13] Assuming 150 work days, for example, this would amount to <30 additional truck trips spread out over a typical 10-12 work day.

significant amounts of contaminated soil during the consolidation phase. The difference in short term impacts between the two alternatives is not significant as risks can easily be addressed by sound engineering and safety practices. Again both alternatives require significant excavation and SC-2B also requires large amounts of contaminated material to be moved during the consolidation phase and capping phase. Finally, the estimated difference in construction time between the two Alternatives is negligible – 18-25 months for SC-2B versus 9-16 months for SC-3B (See additional Responses to Comment regarding reliability and implementation).

5) One comment was also received suggesting that the cap for Alternative SC-2B could be enhanced by planting a native New England wildflower meadow with additional wild life enhancements. In a related comment, such a use would ensure that the community has a stake in the future of the Site, thereby helping to ensure the remedy remains effective in the long term.

RESPONSE TO COMMENT #5

Although Alternative SC-2B has not been selected, the ideas presented are equally applicable to the selected remedy and will be considered during the remedial design. It is not clear to EPA that the beneficial reuse suggested significantly impacts either the long term effectiveness or permanence of this alternative.

6) One comment was also received questioning whether the selected remedy was "cost-effective"given that Alternative SC-2B provides greater net risk reduction . In a related comment, the commenter questioned whether selection of Alternative SC-3B as the remedy would be consistent with EPA Guidance.

RESPONSE TO COMMENT #6

After carefully reviewing the EPA guidance cited by the commenter, EPA strongly believes the selection of Alternative SC-3B is consistent with its guidance. First, as discussed in ROD, the selected remedy is cost-effective. More than one Alternative can be "cost-effective" when evaluating cleanup alternatives. Short term impacts under Alternative SC-3B would be controlled through the use of engineering controls such as dust suppressants, air monitoring and truck decontamination procedures common in the HAZMAT industry. As a result, there are negligible differences in short term impacts between SC-2B and SC-3B. In addition, there are negligible differences in the implementability of either alternative as both involve routine waste management. EPA disagrees that Alternative SC-2B provides greater net risk reduction because under alternative SC-3B, waste exceeding cleanup levels is no longer present at the site. The selected remedy has greater long term effectiveness and permanence. EPA's presumptive remedy guidance is not applicable to this Site as discussed above, and, as a result, the related guidance regarding reuse of landfills is also not applicable.

7) A commenter noted that access to the Site under Alternative SC-2B can be achieved in ways other than locked chain link fencing. SC-2B provides greater net risk reduction. As an alternative a rock wall or a post and beam fence could be constructed.

RESPONSE TO COMMENT #7

Based upon EPA's experience, fences constructed around Superfund Sites to control access are typically eight feet high and many times include additional components such as barbed wire.
EPA agrees that there are more aesthetically pleasing ways to restrict site access than chain link fencing. It is debatable however, whether post and beam fencing, for example, sufficiently restricts site access as it is easily dismantled, and provides limited deterrence to vehicular traffic, etc.. In addition, while a rock wall with limited openings for access, could be constructed around the site that could effectively restrict trucks and cars from access to the Site, it would be difficult to prevent other vehicular traffic (motor bikes and ATVs) while still allowing pedestrian traffic access to the landfill for passive recreation. In addition, there are components to Alternative SC-2B that could be subject to vandalism by individuals such as vents included as part of the landfill design.

EPA has included a temporary chain link fence as a component of the selected remedy to address health and safety requirements during the time that the remedy is being constructed. EPA has allowed flexibility in the selected remedy for the fence to remain or be removed once construction is completed.

8) One comment was received expressing concern that Alternative SC-3B does not provide equivalent or greater reduction in mobility of contaminants than Alternative SC-2B because residual material with contamination below cleanup levels will mobilize and perhaps result in an unacceptable risk in the future as our understanding of risk evolves. In a related comment, because residual waste remains at the Site, the permanence of the remedy is impaired. As a result, Alternative SC-2B provides greater long term protection than Alternative SC-3B.

RESPONSE TO COMMENT # 8

Section 121(c) of CERCLA was included in the Superfund law to address the concerns raised by this comment. This Section provides that remedial actions that result in hazardous substances, pollutants or contaminants remaining at a Site must be reviewed no less often than every five years to assure that human health and the environment continue to be protected by the selected remedy. Because both Alternatives SC-2B and SC-3B allow contamination to remain on site above levels that will allow unrestricted use, this five year review component was included as a requirement for both Alternatives. As part of this review, EPA evaluates changes in science that have occurred that would place into question the protectiveness of the remedy. As a result, action can be taken to address newly discovered risks.

In addition, Alternative SC-3B includes plans for continued monitoring to make sure that Site conditions do not unexpectedly change over time. Again, monitoring, was also required in Alternative SC-2B because of similar concerns. This commenter's theoretical concern that residual material left on site could present a risk in the future should later scientific assessments determine this contamination poses a risk would appear to be adequately addressed by both the five year review provision and continued monitoring of site conditions.

EPA notes that the concern regarding residual contamination and mobility raised by the commenter as to Alternative SC-3B, is also a concern with Alternative SC-2B. Under SC-2B, only a small portion of the 9 acre site will be capped (2-3 acres). Residual material will remain uncapped, capable of mobilizing under Alternative SC-2B on the majority of the Site.

EPA disagrees with the commenter's statement that leaving residual material below cleanup levels on site affects the permanence of Alternative SC-3B and that Alternative SC-2B likely provides greater overall protection. Both Alternative SC-2B and SC-3B leave the same amount of residual material on site. Alternative SC-3B provides greater overall protection because all waste material that presents an unacceptable risk will be *permanently* removed from the Site. Alternative SC-2B does not permanently remove chemical waste from the site or address it by treatment but rather leaves this contamination beneath a cap in the long term. Although EPA believes caps are effective from an engineering perspective, they are subject to deterioration over time and must be continually operated and maintained. Even with the most effective operation and maintenance, technical problems do occur from time to time and as a result, such technology is neither as permanent or effective in the long term as permanently removing the waste from the Site.

9) The same commenter also expressed concern that impacted source materials present at ALI could recontaminate materials left uncapped at Shpack under Alternative SC-3B.

RESPONSE TO COMMENT #9

This is a concern regardless of which alternative is selected – either this material will recontaminate the cap that has been put in place under Alternative SC-2B or the clean fill under SC-3B and would need to be included in the design of either alternative. As a result, this issue will be addressed as part of remedial design.

10) A comment was also made that EPA selected capping over excavation and off-site disposal in a similar situation at the Raymark Superfund Site.

RESPONSE TO COMMENT #10

EPA believes it is, at best, very difficult to compare the selected remedy at one site with the selected remedy at another as each site presents unique issues in terms of appropriate cleanup. That being said, the Raymark Site involved significantly different contamination, principally asbestos, than that found at Shpack. The principal risk associated with asbestos

(a known carcinogen) is from inhalation of airborne fibers. Unlike Shpack, Raymark did not have radiological waste. Unlike Shpack, the off-site disposal alternative cited in the comment was limited in nature because Raymark is a much larger Site, both by volume and size and the depth of waste exceeding cleanup standards. As a result, the off-site disposal alternative cited by the commenter still required that the site be capped (ie most waste was left in place)[14].

As discussed previously, there are negligible differences in short term impacts between SC-2B and SC-3B. In addition, there are negligible differences in the implementability of either alternative as both involve routine waste management technologies.

11) One commenter noted that selection of Alternative SC-3B would trigger review by EPA's National Remedy Review Board (RRB). This would delay implementation of a protective remedy.

RESPONSE TO COMMENT #11 – Because of some of the unique circumstances at the Shpack Site, Alternative SC-3B did not need to be reviewed by the National Remedy Review Board. Therefore, there will not be a delay due to involvement from the RRB.

12) Another comment was received expressing the belief that Alternative SC-3B poses multiple implementability challenges. In support of this, the commenter cites potential structural issues involved in excavating waste next to the ALI Landfill.

RESPONSE TO COMMENT #12

Each Superfund Site presents its own unique technical/engineering issues. The issue of engineering the excavation near the border with the ALI landfill will be addressed during the design phase of the project. The depth of excavation in this border region (near ERM 101-B, estimated depth 6-8 feet below ground surface) is relatively shallow. Excavating this material is neither impracticable nor technically infeasible. If there are issues with slope stability, they can easily be addressed with engineering controls.

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[14]In addition, EPA takes into account changes in science, technology and cost that have occurred when making remedy decisions at different points in time. For example, the Raymark ROD was written almost 10 years ago and circumstances noted in the *Hardage* case cited by the commenter occurred over 15 years ago. This commenter also cited to language in the *Hardage* decision for support that containment remedies are "superior" to excavation remedies. In the *Hardage* decision, the court rejected EPA 's plan to excavate 18,000 barrels and associated waste, a situation distinct from Shpack, in favor of a containment remedy. The differences between the two sites are too numerous to note. However, as pointed out by the commenter, substantial *site specific* evidence was introduced at trial to support the different remedial approaches. Again, remedy decisions are site specific-- each decision based on its own unique facts including current science and technology..

13) A comment was also received concerned that the costs for Alternative SC-3B are disproportionate to risk reduction achieved. In a related comment, the commenter stated that Alternative SC-3B achieves less net risk reduction than Alternative SC-2B.

RESPONSE TO COMMENT #13

EPA believes, taking into account all appropriate factors, that the cost is proportional to its overall effectiveness. (See discussion of Cost-Effectiveness in Section H of the ROD).

In addition, EPA disagrees that Alternative SC-3B achieves less net risk reduction. In fact, risk reduction is greater because all waste exceeding cleanup levels is removed from the site under Alternative SC-3B. (See Response to Comments regarding risk reduction).

14) One comment was received noting that once the radiological, dioxin and PCB material is removed from the Site, Shpack will be just like any other municipal landfill.

RESPONSE TO COMMENT #14 – EPA believes, however, proper remedy decisions can only be made at complex sites such as this by viewing the Site as a whole. To eliminate the excavation of this material from the evaluation of clean up alternatives is to ignore a major defining characteristic of this Site. The relative shallowness of the excavations of waste exceeding site cleanup levels, as well as the relatively small volume estimated in the FS to be exceeding these levels make this site very unique from most municipal landfill sites which have very large quantities of waste at inaccessible locations making removal of the waste impracticable.

A. The commenter has also included lists of sites from different EPA databases in support of this comment. The first such list is included in Table1 of the comment and identifies 149 Sites where landfills have been capped.

RESPONSE TO COMMENT #14.A

EPA agrees that there are many landfills across the country where EPA concluded construction of a cap was the appropriate remedy. As discussed previously, it is hard to compare remedial responses at different sites with one another because each site presents unique factors, including community and state acceptance, that must be taken into account in the selection of the remedy. As a result, it is difficult to agree that EPA has effectively capped sites like the Shpack Site without taking into account other criteria, based upon the

information in this Table. The relative shallowness of the waste exceeding site cleanup levels, as well as the relatively small volume estimated in the FS to exceed these levels make this site different from many sites which have very large quantities of waste at inaccessible locations. In addition, other unique factors may apply at individual sites.

B. This commenter also included a sample selection of sites in having "similar" contamination where waste has been left in place under a cap (Table 3 of comment).

RESPONSE TO COMMENT #14. B

Again it is impossible to compare limited features of sites (in this case "similar" contaminants) against one another without taking into account numerous other site specific factors that go into remedial decision making. None of these sites cited by the commenter, for example, have radiological waste, a most unique characteristic. In addition, there are numerous sites with "similar" contaminants where the waste has been excavated and disposed of off-site. In Region I, there are several NPL sites, including Atlas Tack, Kearsarge, Salem Acres, Plymouth Harbor, and most recently, Beede in which EPA issued Records of Decision calling for the off-site disposal of "similar" contaminants. Both Atlas Tack and Beede, more recent RODs, require significantly more waste material to be excavated and shipped off-site, 50,000 plus cubic yards at Atlas Tack and 80,000 cubic yards at Beede than that required at Shpack. In addition, there are numerous removal actions in Region I which have been taken in situations where large quantities of waste material exceeding cleanup levels have been excavated and removed from communities rather than capping it in place.

C. This commenter also included what is purported to be a list of sites in Region 1 where landfill capping remedies have been implemented.

RESPONSE TO COMMENT #14.C

This is not a correct characterization. Some of these sites are still in the investigation phase and no remedy has been selected. Some of these sites required waste to be treated on-site unlike the situation here at Shpack (Stamina Mills, W.R. Grace for example). Some of these sites required waste to be excavated and disposed of off-site. A defining factor at most of these sites is the size of the area addressed by the Record of Decision, significantly larger than that considered at Shpack.. None of these sites, with the exception of the Nuclear Metals Site (no cleanup plan has been selected), have radiological contamination. An area of the Nuclear Metals site was capped as part of a Superfund Removal Action, but this is considered an interim measure pending a full Remedial Investigation.

In conclusion, the Shpack Site presents its own unique set of factors, most significantly the presence of radiological contamination, the relatively small volume of waste that is estimated to exceed cleanup levels, and the fact that much of the contamination that must be addressed is near the ground surface that make it unique from many other sites that have been capped in place.

Enforcement

1) Some commenters noted that a significant portion of the Site cleanup costs will be borne by the US Army Corp of Engineers under the FUSRAP program. Other commenters noted that the Towns of Attleboro and Norton could end up bearing a significant portion of the costs in the future given their involvement at the Site as owners or operators. One comment was received saying a trust fund could be put in place to ensure the continued integrity of the cap, and other long term components of remedy.

RESPONSE TO COMMENT #1

Comments regarding who is or should be responsible for paying for the cleanup are basically comments regarding enforcement and are not appropriately addressed as part of this responsiveness summary. In addition, comments that relate to funding agreed to as part of an enforcement action are also enforcement issues and are not appropriately addressed as part of this responsiveness summary.

2. One comment was received supporting Alternative SC-3B because by removing the contamination at Shpack liability for additional contamination will probably belong to ALI.

RESPONSE TO COMMENT #2

Comments regarding liability are comments on enforcement and are not appropriately addressed as part of this responsiveness summary.

Additional Comments

1) Comments were also received asking that ALI be addressed.

RESPONSE TO COMMENT #1

ALI is being addressed under separate regulatory authority administered by the State under its solid waste landfill program. EPA does not have authority under the Superfund program to address ALI at this time. Issues relating to

ALI are referred to the Massachusetts Department of Environmental Protection.